The Builder.

VOL. LXXIV. No. 2881. APRIL 23, 1898.

ILLUSTRATIONS.

New Chancel and Chapels, Church of the Sacred Heart, Wimbledon.—Mr. F. A. Walters, F.S.A., Architect ..... *Double-Page Ink-Photo.*
Competition Design for Granard Presbyterian Church, Putney.—By Messrs. J. C. T. Murray and C. E. Mallows ..... *Double-Page Photo-Litho.*
Piggot's Manor, Herts.—Messrs. Hesketh & Stokes, Architects ..... *Single-Page Ink-Photo.*
Billiard Room, Piggot's Manor.—Messrs. Hesketh & Stokes, Architects ..... *Single-Page Ink-Photo.*
Suburban Houses, Birmingham.—Messrs. Bateman & Bateman, Architects ..... *Double-Page Ink-Photo.*

Blocks in Text.

Town Hall, Wallingford ..... Page 384
Town Hall, Abingdon ..... „ 385
Grille, Currey Rivell ..... „ 386
Tombstone, Dorchester ..... „ 386
No. 19, Fleet-street ..... „ 387
Plan for Granard Presbyterian Church, Putney ..... Page 394
Piggot's Manor, Herts ..... „ 395
Diagrams Illustrating Students' Column ..... „ 398
Hewens' Patent Manhole Cover ..... „ 403
The "Certainty Company's" Chimney Cowl ..... „ 403

CONTENTS.

English Renaissance Architecture.—II. 383
Notes 386
The Scientific Rationale of Glass Painting 388
The Royal Institute of British Architects 389
Lessons from Fire and Panic 391
Church of the Sacred Heart, Wimbledon 394
Design for Granard Presbyterian Church, Putney 395
"Piggot's Manor," Herts 395
Suburban Houses, Birmingham 395
The Surveyors' Institution 395
Architectural Societies 396
Competitions 397
Engineering Societies 397
The London Building Act, 1894 397
Books Received 397
The "Warrant" Design for St. Paul's 397
"Beauty in Engineering Design" 398
Students' Column: The Calculation of Strength of Materials and Resistances.—XVI. 398
Obituary 400
General Building News 400
Sanitary and Engineering News 401
Stained Glass and Decoration 401
Foreign 402
Miscellaneous 402
Capital and Labour 403
Meetings 403
Recent Patents 404
Some Recent Sales of Property 405
Prices Current of Materials 405

English Renaissance Architecture.—II.

THE two most powerful and original among the "personal designers," as we have ventured to class them, of the later English Renaissance were unquestionably the two principal among those who immediately followed Wren—viz.: Vanbrugh and Hawksmoor, and perhaps partly because they were more directly under the inspiring influence of Wren's genius, the latter having been in fact the pupil of the architect of St. Paul's. Vanbrugh is indeed very different from Wren, and in regard to refinement of taste and perception in design very much his inferior; yet one may well conclude that his obvious ambition to do splendid and remarkable things was indirectly born of the influence of Wren and the emulation which the works of the latter excited. There is no English architect of the Renaissance concerning whom there has been so much difference of opinion. A great deal of his work was ridiculed during his own lifetime; and not without reason. He seems to have been possessed by a kind of "megalomania," and having begun as an amateur, and given no very careful study to architectural plan, structure, and detail, he had not acquired the judgment in regard to questions of proportion and taste, or the power of general grasp of a design as a whole, which was especially necessary in order to control his vaulting ambition. The façade of Blenheim is a *mélange* of details which are out of proportion, which show no proper subordination to a leading idea; the architect attempts to compel our admiration by sheer bigness and boldness. Look at the ponderous and useless attic erection, for instance, over the rusticated blocks of buildings at the extreme angles of the central mass, the palace itself; an erection twenty feet high, and with angle acroteria of fifteen feet more, for mere architectural bravado and to add to what may be called the scenic effect. And yet in a sense it must be admitted that one's admiration *is* compelled; one may find all kinds of faults of taste in the façade, but it is at all events impossible to despise it; it is the work of a giant, though a rather "robustious" one, as giants, both in art and in fairy tales, are wont to be. The plan of the whole, impracticable as it is in many ways, is grandiose to a degree. The portico of Eastbury House, again, as figured in "Vitruvius Britannicus," with its immense rusticated columns out of scale and proportion, is the design of a man who is determined, whatever else he may fail in, at least to arrest your attention and impress you. And if this is not the best quality in architecture, it is better at least than the graceful feebleness and tameness of some of Vanbrugh's successors. Vanbrugh was perhaps at his best, however, when circumstances restricted him somewhat in regard to the scale of his building, and he was compelled to exhibit his passion for large and massive effect in a more concentrated manner. For this reason we have always thought that Seaton Delaval—now we believe, either in ruin or going to ruin—was his best work. He there contrived to impress on a house not of the largest scale an expression of grandeur and dignity which has seldom been surpassed in English mansion architecture.* His manner of giving dignity and mass to a small and plain street front was also shown in the design which he made for the old opera house in the Haymarket in which many of Handel's operas were produced, a drawing of which is in the Crace collection of the British Museum.† It is noteworthy that Vanbrugh's genius excited the high admiration of Reynolds, who admired the skill in composition with which, "to support the principal object, he produced his second and third groups or masses." But this, as Mr. Blomfield truly remarks, is looking at architecture rather too much from a painter's point of view, as a subject for free composition unhampered by practical requirements; and that was just Vanbrugh's own position: he regarded the plan as subordinate to the effect, and in all probability designed his "masses" first and made the plan fit them afterwards. Yet we do not think any discreet critic will dissent from the sentence with which Mr. Blomfield dismisses him, to the effect that "his passionate appreciation of the abstract qualities of architecture gives him a place by himself among the architects of a country in which the very existence of those qualities has almost ceased to be recognised." These be very bitter words, but it is to be feared they are too true.

Mr. Blomfield's view of Hawksmoor, which we think critically correct and very well put, is that his style was the product of the mixed influence of Wren and Vanbrugh. He was "a well-trained architect," consequently with much more scholastic acquisition than Vanbrugh, who "was incessantly trying to translate Vanbrugh into terms of Wren;" and in this respect he draws attention to the curious contrast between the lower and upper portions of the façade of St. Mary Woolnoth, the lower portion obviously designed under the influence of Vanbrugh, the crowning turrets showing a reminiscence of Wren. It is an additional testimony to the influence exercised by Vanbrugh's masterful spirit in architecture, that he should thus have had power to influence Wren's own attached and devoted pupil. But to our thinking Hawksmoor had more of the originality and shaping faculty of Wren than any other of that master's successors. If we compare two such towers as that of Spitalfields Church and St. George's, Bloomsbury, both so individual in character, and so entirely different, we recognise there the same kind of inventive faculty which enabled Wren to give such extraordinary variety to a number of towers, all formed, as one may say, out of the same general repertoire of architectural materials. We quite agree with Mr. Blomfield that Spitalfields, next to St. Bride's and St. Mary-le-Bow, is the finest Renaissance steeple in London, and one showing great boldness and originality of design.

Whatever faults may be found with the work of Vanbrugh and Hawksmoor, in regard to refinement of taste in proportion and detail, they may be said to close the short but striking chapter in English Renaissance architecture in which the materials of Classic architecture were made the basis for the evolution of really original and striking designs, architectural creations not depending absolutely upon any precedent; the chapter almost entirely occupied by the work

* A drawing of the house, with a plan, by Mr. J. W. Twist, was published in the *Builder* of April 22, 1893.

† A reproduction of this drawing was published as a frontispiece to a collection of essays on music, "Thoughts on Music and Musicians," by the Editor of this Journal.

of Wren and these two brilliant satellites. Flitcroft's comparatively weak but still original steeple of St. Giles-in-the-Fields is perhaps the only other Renaissance steeple in London which somewhat reminds us of the inventive power of Wren. Gibbs's steeples of St. Martin-in-the-Fields* and St. Mary-le-Strand, more graceful works in a sense than any of Hawksmoor's, are in comparison academical—mere putting together of features that could be got out of books, except perhaps the spire portion of the former, which however is rather weak. As Mr. Blomfield says, in entering on the consideration of the period immediately following Hawksmoor:—

"Architecture had already become an elegant accomplishment of the upper classes. To the free masculine intelligence of Wren had succeeded mere scholarship, rapidly degenerating into pedantry. When a correct use of the orders, according to the recognised canons, was the test of architecture, and the question of cost was seldom raised, the amateur very soon stepped to the front, and began to furnish designs of his own, or, at any rate, to give instructions to draughtsmen who were content to leave to the amateur the credit of the design. A little later we shall find Lord Burlington represented as one of the first architects of his time. Architects probably found it inconvenient to question the claims of their distinguished patrons, but occasionally the "ghost" lost his temper, and amusing revelations followed."

In reference to Lord Burlington we may observe, though we have not space to go into the matter, that Mr. Blomfield gives very good reasons for the opinion, which is on general grounds the most probable one, that Lord Burlington was merely an aristocratic patron of architecture, who made suggestions which other people carried out, and that all he had to do with Burlington House, as with other designs called his, consisted in the function of paying the bill. Aldrich was an amateur of another stamp, whose learning in music, which was one of his pursuits, is unquestionable and is attested by sundry clever compositions, and therefore we may presume that when he professed to design architecture he also did his own work; though we think that the tower of All Saints, Oxford, which Mr. Blomfield approves and gives a sketch of, is not more connected and coherent in its various stages, though less imitative, than that of St. Pancras in London. In short, it is very likely Aldrich's own design, in view of the very fact that it is somewhat amateurish.

The course of our Renaissance architecture from the time when it took its purely Academical turn is to a great extent, at least as far as the works of its leading architects are concerned, exemplified and illustrated in the monumental folio publications which now began to play an important part in architectural literature, and which, while they had their origin in the fact that architecture had now become a thing of rules and precedents rather than of inventive genius, had their own influence in further promoting the habit of looking at and studying buildings on paper rather than in the round. Of these the most comprehensive of course is the "Vitruvius Britannicus," edited by Campbell, as this was a collection of designs by various architects from Inigo Jones downwards, while most of the other prominent folios were "one-man exhibitions," each brought out by one architect with a single eye to his own glory, at once a monument of his own achievements in the past and a suggestion for his employment in the future. There is something at once impressive and pathetic about these great tomes, with their sturdy bindings, large margins, and boldly-printed title-pages in colossal lettering, and the hard mechanical line-shaded elevations which they show us, where so much manual labour is expended on so little detail that is of any interest or individuality. It is in the plans rather than in the elevations that we must look for any variety or suggestiveness of ideas. Campbell, who made "Vitruvius Britannicus" serve his own purpose by inserting in it a rather large proportion of his own designs, under colour of giving a general illustration of the architecture of his age and country, propounds on one plate "a new design of my own invention," but one has to look hard for the novelty, which seems to consist only in a slightly different manner of placing and proportioning the inevitable order of the portico. The "Prospect of Montague House to the street" shows us only the prospect of a huge blind wall covered with panels (where the lofty iron railing of the British Museum now stands). Archer is credited with an original and rather effective plan for a pavilion for the Duke of Kent, based on a double triangle, with alternate square and semicircular projecting bays. Wilberry House, belonging to Mr. Benson, was "invented and built by himself in the style of Inigo Jones," but his portico is too weak and small for the wings. Hapton or Hoptone House, with its colonnades in convex (not the usual concave) quadrants connecting the main house with the wings, is in some respects a fine plan. Braman Park, with its sloping drives up to the door, and the open column screen on each side connecting the house with the wings and giving access to the back, has some originality of arrangement. Houghton and Wanstead, both by Campbell himself, are both good and sensible designs in their way: Wanstead, with its central portico, raised centre, and lower wings, all on the most symmetrical lines and of the "box of bricks" type of architecture, has nevertheless dignity and good proportion; and Houghton is a design of the same class, which however looks much more pleasing and picturesque in the photograph published in Mr. Blomfield's book, showing the side without the order, and with Ripley's domes at the angles. So with many of the houses lined out in elevation in this hard and uninviting manner; they produce a better impression in actual existence than they do in Campbell's folio pages. In fact, nothing put together in stone by the hands of artisans with human forces and feelings could have the life quite so much squeezed out of it as it is in these plates of "dried specimens."

Ware's "Complete Body of Architecture," less an illustrative than a theoretical book, is a formidable *résumé* of the architectural ideas of the day (1756), not without its amusing passages. In regard to the employment of the orders he is particular in recommending that if more than one order is employed, the heavier and more solid one should be at the lower portion of the design, though he adds in a cautionary spirit, "they

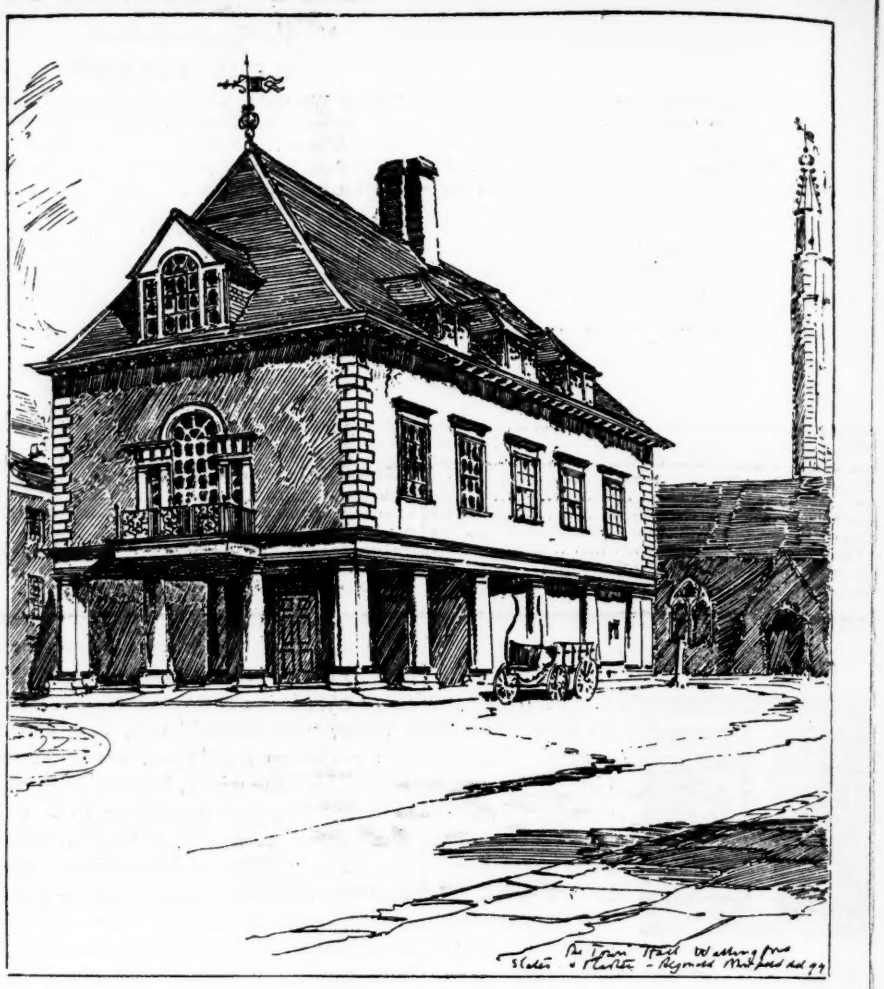


Fig. 1.—Town Hall, Wallingford.

* We observe that both Mr. Blomfield and Mr. Wheatley (in his valuable book "London Past and Present") give the name of this church as "St. Martin's-in-the-Fields." This is surely a popular error. It is the saint who is "in the fields," not the building. Part of St. Martin's sanctity consisted in his living for a long time an ascetic life on a desert island. There are other churches dedicated to "St. Martin-in-the-Fields" in this country; and if we remember right, we meet with the dedication to "Saint Martin-aux-Champs" in France.

Fig. 2.—Town Hall, Abingdon.

must be very magnificent buildings indeed in which there are several series of columns." His remarks on arches are worth quoting :—

"By arches the student should understand segments of a circle. The Gothick are disclaimed, and there is no form which is capable of so much strength as the plain sweep of a true circle : the elliptick we have treated of elsewhere, and they should never be admitted for bridges." [The reason for this, if there were any in his mind, he does not trouble to give.] "In the first construction of buildings the Gothick or sharp arch was not unnatural, but they improved who took off the point."

His design intended for Westminster Bridge is, however, rather a fine one.

Jas. Paine's "Plans, elevations, &c., of noblemen's and gentlemen's houses" is another of the illustrative folios ; Mr. Blomfield, we observe, dates it 1783, but the copy in the Institute Library has the date 1767. There is a grandiose character about some of the designs—Sandbeck for instance ; and Worksop, as planned but never fully carried out, is a very grand conception of plan for a mansion on the largest scale. Richmond bridge, of which Paine was the architect, figures in an elevation in the book ; here again it is curious to note how far inferior is the impression conveyed by the drawing to that of the actual erection. Gibbs's "Book of Architecture," though considerably earlier than Paine's (1728), has a more modern air both in the style of the designs and in the make-up of the drawings. His plans and elevations for houses may mostly be described as eminently sensible, and a design for a circular church (not carried out) has a good deal of merit and even of originality. Then we come to what may be called the posthumous volumes of the "Vitruvinus Britannicus," Gandon's continuation of Campbell's work, and like that a collection of designs by various architects. One or two of Chambers's mansions shown here have striking or unusual points in plan and treatment, Dudingstone for instance, with the main block of the house not in the centre as usual, but in front on the left of the whole group, the inferior block and the stables ranging away behind and to the right and connected by corridors with the house. Vardy's Spencer House appears here, much inferior in drawing to its actual impression, and Dance's poor design for the Mansion House, which, oddly enough, impresses one more favourably in the drawing than in the actual building. Woolfe's plan of Gopsal shows one good point ; he gets the favourite effect of the connexion of the wings to the house by a concave quadrant, by the use of a pilastered wall only, with no building behind it ; the architectural effect in front is the same, and the difficulty of arranging rectangular rooms in the rear of the quadrant is avoided. There is something suggestive in Wood's long narrow plan of Buckland, with its possibilities of vista ; in the plans of Witham by Adam a great deal of internal interest is provided for by the clever and unexpected arrangement of the rooms ; and Haythorpe (the architect's name is not given) shows a fine plan, and a fine effect is gained in the elevation by the decoration of the centre block with an order the whole height of the block and very richly treated, contrasted with the exceedingly plain design of the wings.

There are two features in the treatment of great mansions which constantly re-appear in the plans and designs illustrated in these monumental folios, both of which are architecturally fine, though both would be regarded in the present day as unpractical if not impracticable. One is the manner of placing the offices and inferior apartments in separate "wings" connected with the mansion by curved colonnades or quadrants. Of the architectural effectiveness of this there can be no question ; but as a matter of plan it is a system eminently inconvenient for the working and traffic of a great house. The other is the system of treating the lower story of the house architecturally as a basement, rather low in proportion and massively designed, and providing access to the *piano nobile* by a great double flight (generally) of external steps. For dignity and grandeur of effect this is the treatment *par excellence* for a great mansion on the largest scale. It is sacrificed in these luxurious days because people will not, it is supposed, consent to have to go up a flight of external steps to reach the house. We put it as a question worth considering, whether the slight inconvenience, which in fact only exists in bad weather, would not be more than compensated for by the stateliness of the effect. To our thinking the loss of these external flights of steps is the greatest loss which mansion architecture has sustained in modern times.

In giving a few more illustrations, from the second volume of Mr. Blomfield's book, we have preferred to select those from the interesting chapters on "The Trades," the state of masonry, carpentry, ironwork, &c. during the later period of the English Renaissance. These chapters are full of interest, and the illustrations lead us into the region in which we come on the more naïve use made by country workers of the materials of Renaissance architecture. Grandeur is not here, but picturesque interest is more to be looked for than in the class of buildings connected with the names of the eminent architects ; and it would perhaps be difficult to find buildings of this scale more interesting in themselves, or more characteristically English, than the town halls of Wallingford and Abingdon (figs. 1 and 2). Among the examples of ironwork in the book there is nothing that pleases us so much as the simple but truly artistic tomb railing from Currey Rivell in Somersetshire (fig. 3). The tombstone at Dorchester (fig. 4) Mr. Blomfield gives as an illustration of "that traditional skill which enabled the mason of the seventeenth century to carve his stones as well as to lay them . . . . while Artari and Bagutti were modelling conventionalities in stucco for Gibbs, the stone-mason

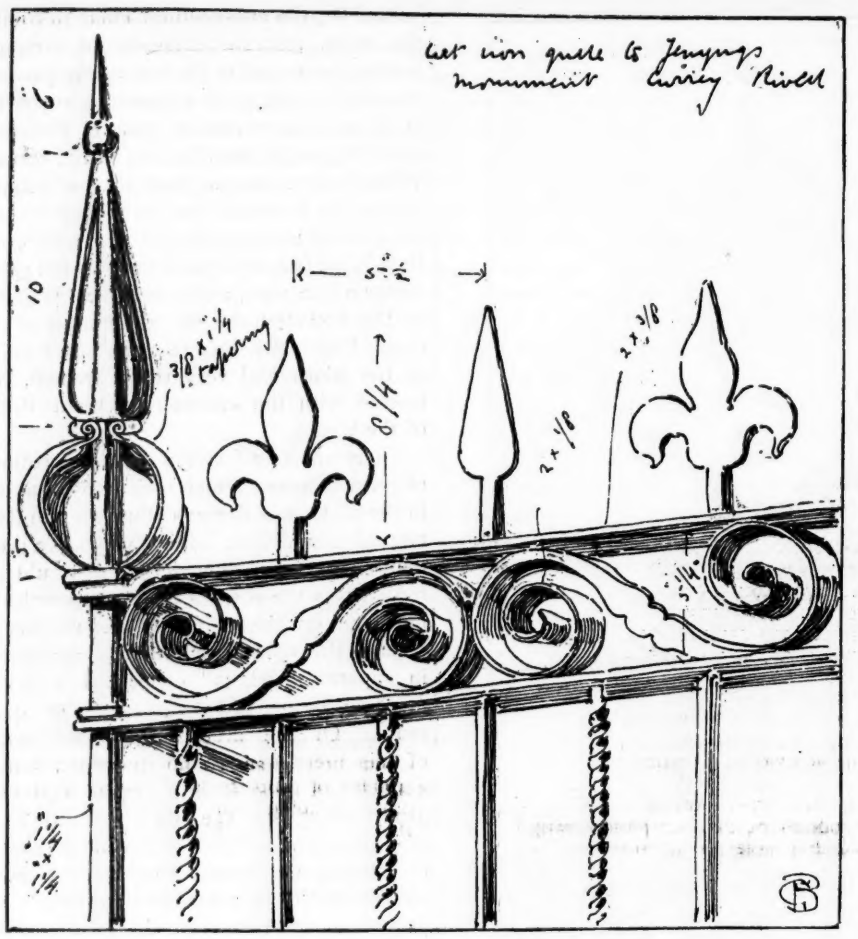


Fig. 3.—Grille, Currey Rivell.

at Dorchester was cutting on his tombstones the mallows and forget-me-nots [of the meadows round his home." Perhaps the author's enthusiasm has led him to regard that as a typical example which is rather a happy exception. A considerable amount of wandering in country churchyards has not led us to the conclusion that there is much of inspired or unconventional ornament to be found in them. But this example is at all events a very charming one, and we may thank the author for having unearthed it.

And now, in this present Renaissance of the Renaissance which we are in the midst of, what further are we to hope for in the way of development? One thing seems certain; we shall not get much further by merely studying and reproducing, as too many young architects are doing, the characteristic features and details of the English Renaissance; the treatment of the orders, the method of employing rustication, the broken pediments, &c. We shall get tired of all these things presently, and there is only an *impasse* that way. There are perhaps two lessons that may be capable of new application. Inigo Jones taught his contemporaries, and may still teach us, the value of the careful study of proportion of mass and refinement of detail; and some of the later Renaissance architects have shown us examples of great dignity of treatment in the design of large mansions and other buildings, but in a cold and academical manner. The picturesqueness of the earlier Renaissance is wanting in them. We seem to be rather taken with the picturesqueness of the earlier work at present, and are somewhat disposed to underrate the value of symmetry and dignity in architectural design. Can we not combine the two qualities in our new Renaissance, and add the picturesqueness of detail of the earlier Renaissance to the stateliness of the later Renaissance. That seems to be a task still left to be accomplished, and the endeavour to carry it out may lead us to something a great deal better and more truly architectural in spirit than the mere reproduction of closely studied details of seventeenth or eighteenth century architecture.

Fig. 4.—Tombstone, Dorchester.

NOTES.

The Stock Exchange and the Building Act.

A FEW days since, Parliament had under consideration an Instruction to the Select Committee on the London Building Act (1894), moved by Mr. Banbury, to the effect "that it be an Instruction to the Committee to take into consideration whether the offices and buildings of the Stock Exchange should be exempted from the operations of Parts VI. and VII. of the principal Act," which regulate the construction of buildings and of temporary buildings and wooden structures. Mr. Pickersgill, in opposing the motion, said truly that all exemptions from the operation of the Act should be most jealously guarded, and moved, as a compromise, that the Instruction should be amended by the substitution of the words, "Parts of VI. and VII.;" an amendment which was lost by 64 to 46, and the Instruction agreed to. We do not quite see what sufficient ground the Stock Exchange can have for claiming to be put in the "exempt" list; it can hardly be said to be a national institution in the same sense, for instance, as the Bank of England. But for the present the Instruction is only that its claims should be considered, and there is no need to object to that. We should expect however to find that the enquiry of the Select Committee will result in their declining to recommend the alteration.

The Proposed Statue, Canterbury Cathedral.

THE proposal of the Dean and Chapter of Canterbury to place a gilt figure of St. Michael on the roof of Canterbury Cathedral, which is being talked about, is a foolish one which we hope will not be carried out. It does not follow that, if there once was a Mediæval figure to give the popular name to the "Angel Tower," there is anything to be gained by placing a modern one there, which cannot be in harmony with Mediæval work. It is not the case of an empty niche which seems to proclaim the want of a statue; there is no sense of any omission to be remedied, and therefore no necessity for the intrusion of a modern work of the kind. It is true that the French have recently done exactly the same thing at Mont St. Michel, and employed one of the first of their contemporary sculptors to execute the work (an example which would not be likely to be followed at Canterbury); but the French hardly furnish the best precedents in regard to the modern treatment of mediæval buildings.

The Condé Museum, Chantilly.

THE collection at the Château of Chantilly, which, as we have already noted, is to be now known as the "Musée Condé," was opened to the public on Sunday last, when a crowd of visitors evinced the greatest admiration for the splendid legacy left by the Duc d'Aumale to the French nation. Among the paintings, the Italian school is represented by works of Raphael, Lippi, Botticelli, and Fra Angelico; the Flemish school by Memling and Van Dyck; the French by Poussin, Largillière, and Watteau among the ancients, and Meissonier and Corot among the moderns; and among English works is a splendid portrait of "Philippe Egalité" by Reynolds. The collection of enamels of all periods, and the splendid series of drawings by great artists, from Giotto and Pisanello down to Charlet and Delacroix, also attracted great attention. One of the most curious features of the museum is the collection of forty miniatures by Jehan Fouquet for the *livre d'heures* of "Maître Etienne Chevalier." Added to all these is the profusion of splendid tapestries, furniture, books, and armour; the whole together forming one of the most remarkable artistic collections in the world. We may add that

at the suggestion of M. Gérôme, the town council of Chantilly have determined to erect an equestrian statue of the Duc d'Aumale on the small *place* which separates the Chantilly stables from the high road. M. Gérôme is going to undertake the model for the group.

The Newly-Discovered Cretan Script.

THE most important paper in the new number of the *Journal of the Hellenic Society* (XVII., Part II.) is that by Mr. Arthur Evans on "Further Discoveries of Cretan and Ægean Script." In the course of this paper Mr. Evans publishes and discusses, though he does not yet attempt to interpret, the "inscribed libation table from the Diktæan Cave," which is at present the only instance of a consecutive inscription in the pre-Phenician script. The libation table in question is a dark steatite fragment of a low table, exhibiting cup-shaped hollows with raised rims similar to those of the stone libation-tables of Ancient Egypt. Its form when complete had been oblong, with four short legs and a central stem; it had originally possessed three cups, the central one rather larger than the other two. The inscription is in clearly-cut characters along the upper margin of the table. The characters belong to the "linear type" of the pre-Phenician script of Crete. Eight letters are partially preserved. Mr. Evans, by the help of comparison with Egyptian monuments, dates the libation table as about 2,000 B.C. The inscription is thus not only separated, *longo intervallo*, from the most ancient examples of Greek writing, but it distances by at least a thousand years the earliest specimens of the Semitic alphabet, as seen on the Baal Lebanon bowls and the Moabite stone.

Buildings for the 1900 Exhibition.

THE French Government has approved the designs for the façades of a portion of the palaces which are to be erected on the Champ de Mars and the Esplanade des Invalides for the 1900 Exhibition at Paris. The buildings for Tissues and Clothing, that for Education, and that for the "Procédés Généraux des Lettres, des Sciences, et des Arts" (we give the original words as we are not quite clear as to the rendering of their intention in English), which are to be on the Champ de Mars, are to be entrusted to two architects, M. Blavette and M. Sortais. MM. Tropey-Bailly, Esquié, Larche & Nachon, Toudoire, and Pradelle, are to be joint architects for the palaces on the Esplanade des Invalides.

Signalling Without Connecting Wires.

SIGNOR MASCONI has recently made some interesting experiments on the Solent on signalling without connecting wires. Two stations were fitted up, one at Alum Bay, on the Isle of Wight, and the other at Bournemouth, and between these places, which are fourteen and a half miles apart, regular communication has been maintained for the last few months. The instruments at both stations consist of the usual induction coil, coherer, relay and Morse printer. A distinctive feature is a tall mast 120 ft. high at each station, one pole of the coherer being connected to the top of the mast, and the other being put to earth. Of course, the rate at which messages can be sent in this way is very slow compared with ordinary telegraphy, but there are many cases in which this method is alone applicable. For example, signalling between ships at sea in all states of the weather, or between ships and the shore could be done by these Hertzian waves. There is not much privacy about this system of signalling, as any electrician in the neighbourhood could read the message if he had a coherer and a Morse printer, but this difficulty might be got over with the help of a code. A more serious difficulty in war time would be that if several ships were signalling at once, all the messages would get hopelessly mixed up. Professor Lodge recently showed to the Physical Society a system which he has invented to partially overcome this difficulty He also pointed out that it is better instead of using a coherer—that is, a tube containing a mass of metal filings—to use simply a needle pressing against a flat spring. This forms the most sensitive of all coherers, and in addition it possesses the great merit of not needing to be tapped mechanically to bring it back to its sensitive state.

Agecroft Cemetery Competition.

THE instructions to architects for this competition, which is promoted by the Corporation of Salford, have been forwarded to us. The competition is for chapels, offices, lodges, &c. The instructions include one most objectionable provision, viz.: that architects are to state, in their report accompanying the drawings, the percentage on the estimate which they expect as their professional fee; in other words, the architectural commission is put up to the lowest bidder. No architect of any standing, the Corporation may be assured, will have anything to do with a competition on those terms. Furthermore, we observe that the plans of chapels, offices, and lodge are to be to a scale of $\frac{1}{4}$ in. to the foot—a larger scale than is usual even for working drawings, and that, in consideration of the payment of premiums of 50*l.*, 30*l.*, and 20*l.*, the Corporation propose to retain three of the designs as their property. If they were sketch designs there would be less objection to this last provision; but what they are asking for amount to working drawings, for which such sums as are offered are no remuneration.

Goslings & Sharpe's Bank, Fleet-street.

WE are informed that the new offices for this bank will be erected after the designs of Mr. A. C. Blomfield, of the firm of Sir A. W. Blomfield & Sons. The business of the firm was amalgamated with that of Messrs. Barclay, Bevan, & Co. two years ago, and now forms the Fleet-street branch of Barclay & Co., Limited. About the middle of the seventeenth century the Lombard-street and West Cheap goldsmiths and "keepers of running cashes" began to move to Fleet-street and further westwards; in 1650 Henry Pinckney traded as a goldsmith at the sign of the "Three Squirrels" in Fleet-street, opposite St. Dunstan's Church. Some years afterwards, James Hoare, of the "Golden Bottle," moved to Fleet-street from Cheapside. After the Great Fire, Pinckney rebuilt the premises, his landlord, Thomas Thorold, adding the site of the adjoining house, the "Holy Lamb." Pinckney died in 1678; his brother William, a goldsmith at the "Golden Dragon," next door, succeeded to the business. It appears that the existing two houses cover the sites also of Hercules Pillars (or Gun-in-Hand) alley, the "Crown," the "Three Daggers," and the "Wheatsheaf." In course of time Sir Francis Gosling, alderman of Farringdon Without succeeded (1742) John Simpson as partner of Thomas Ward, who died in 1743. That same year the firm's name was changed to Gosling and Bennet; in 1754 Robert, brother of Sir Francis, became a partner.

No. 19, Fleet-street, about to be rebuilt.

Sir Francis died on November 29, 1768, the firm being then styled Gosling, Gosling, and Clive; in 1795 it was joined by Benjamin Sharpe, when the long familiar style was adopted. The books, we learn, are preserved from 1715; the roll of customers bears many famous names, including those of Warren Hastings and Lord Clive; Pope and Samuel Richardson; Rivington, Longman, the Tonsons, Lintots, and Woodfalls; Bishops Warburton and Percy of Dromore; Lords Ellenborough, Camden, Campbell, and Denman; and the *Times* and *Morning Advertiser*. On the pulling down of Lud Gate, Sir Francis Gosling obtained the statue of Queen Elizabeth for the church of St. Dunstan-in-the-West (rebuilt, 1831-3, by J. Shaw). A model of the "Three Squirrels" was in Mr. G. Birch's Old London street at the Health Exhibition 1884. We understand that the original painted sign of the house, recovered about forty years ago, together with the watchman's-box standing outside, within the railings, will be carefully preserved.

Highgate Grammar School.

THE governors are about to erect additional buildings on the site of the entrance gate and some old houses adjacent. The school was originally built near an ancient hermitage, latterly known as the Gate-house, where toll was taken for the Bishops of London from travellers on the road between St. Pancras (through Kentish Town) and Barnet as they entered the Bishop's park. Sir Roger Cholmondeley, Lord Chief Justice *temp.* Edward VI., founded the school in 1562; the present school chapel and most of the buildings were erected about thirty-five years ago after the late F. Pepys Cockerell's designs. In the yard of the old chapel, which served the residents of Highgate until the building of St. Michael's parish church, Coleridge was buried, 1834. His gravestone, fenced round with an iron railing, was enclosed within the crypt of the school chapel as built by Cockerell.

Exhibition at the Burlington Club.

THE Burlington Fine Arts Club has got together a collection of works of the Milanese and allied Lombard Schools, which is of great historical interest, and is accompanied by a catalogue containing a great deal of valuable information in regard to the painters represented. From the purely artistic point of view, it must be confessed, the exhibition is not very attractive; it is a collection of mostly rather dull and conventional representations of sacred subjects, unattractive either in colour or design; valuable as representing the work of a school, but not interesting in the abstract. We feel sceptical as to so-called Solario, No. 21, which is described in the catalogue as "formerly attributed to Perugino, and first recognised as a genuine Solario by the present owner." Owners of pictures have rather too much interest in recognitions of this kind, and if we compare it with No. 22, an admitted Solario and a very fine work of its class, it is difficult to believe that these two are by the same hand. One of the most interesting works there, one of the few which has real character, is that by Buttinone, No. 2, "Virgin, Child and Angels." There are a good many interesting examples of Luini, and a good many paintings headed "attributed to Leonardo da Vinci;" but in nearly all cases the attribution is watered away in the notes, and the better for Leonardo's reputation. Still, it is an exhibition for all who are interested in the history of painting to visit.

The New English Art Club.

THE exhibitions of this Club become more and more a melancholy spectacle of perversity and of the degradation of the art of painting. Among the few exceptional works from which one can derive some pleasure, and which seem out of place among their surroundings, are a portrait of a lady (87) by Mr. Furse, the small marble bas-reliefs of cattle and a shepherdess, by Mr. Havard Thomas, a pretty sketch portrait of a girl by Mr. W. W. Russell (70), and some large and small landscape sketches—for they are only sketches—by various contributors; "The River Dudden" (17) by Mr. Oliver Hall; "Moonlight on the Seine" (52) by Mr. Douglas Robinson; "The East Wind in Summer" (67) by Mr. Francis Bate (we cannot see any evidence of wind in the picture); "Spring" (75) by Mr. A. Tomson; a landscape with no title (120) by Mr. J. Charles, and two large and coarse but vigorous sketches by Miss Alice Fanner (134, 136) of Thames scenes in windy weather. The remainder of the collection consists mainly of figures and portraits painted in dirt rather than in colour, the most prominent and central one being a naked woman asleep on a sofa in a very ungainly attitude—a painting absolutely devoid of any charm either of line or colour; a number of landscape "splashes" rather than pictures, some of them looking rather like pieces of carpet, and a representation of St. Paul's Cathedral (85), in which the proportion of the dome and towers is all wrong, the latter being represented by formless brush-dabs which do not even suggest the silhouette of the beautiful cupolas, much less their detail. This work, we gather from the private-view "asides," is considered a great success by the habitués of this gallery of cranks, who appear to have no more knowledge of the real architectural forms of St. Paul's than the artist who has pretended to represent them.

Messrs. Dowdeswell's Gallery.

"SOME English Cathedrals and their Towns" is the title of a collection of watercolours by Mr. and Mrs. Harry Hine, on view at Messrs. Dowdeswell's Gallery, which is disappointing after so fascinating a title. As landscapes many of these have high merit; the best of all perhaps is the small one called "Durham—twilight" (68), a fine little bit both of colour and effect, and there are others which are very interesting as landscape compositions. But unfortunately the buildings, where they form prominent and important objects in the composition, are treated in such a weak and inadequate manner that to an architect the exhibition can have little of the special interest which the subjects seemed to promise.

Works of M. Caran d'Ache.

AT the Fine Art Society's Gallery a collection of drawings by M. Caran d'Ache, the private view of which takes place to-day (Saturday), enables the London public to make a more general acquaintance with a caricaturist whose work recalls the savage days of Rowlandson and Gillray, except that, being more palpable and exaggerated caricature, amounting often to extravaganza, it gives perhaps a less cruel impression. A whole room full of this kind of thing is rather too much, but we recognise the artist's remarkable power of line drawing, and the biting satire contained in many of the designs. Among the best, intellectually, are the series of sketches for placing Napoléon on the stage and for "Napoléon in Private" (Nos. 8 to 12), and the splendid one of M. Faure as the Gallic cock, escorted by the Russian eagle through the Peterhof Gallery, in face of the bust of Louis XIV. A few powerful charcoal sketches of military subjects exhibit another side of the artist's talents.

THE SCIENTIFIC RATIONALE OF GLASS PAINTING.

1. *The Glass.*

GLASS is a mixture of several silicates with some free silica. Although in many respects it may be looked upon as a salt in which the silica forms the acid element, yet in actual practice the proportions of acid and base are not according to their combining weights. And although it is true that in general the more nearly the proportion of silica approaches the amount necessary to form definite compounds with the basic ingredients, the better and more stable is the glass, yet the proportions of the various constituents so modify the qualities of the product, fusibility, &c., that in practice proportions are taken that will give to the resulting glass the particular properties desired.

Glass, as we ordinarily know it, is a compound of silica with at least two metallic oxides, one oxide belonging to the group known as the alkalies and the other belonging to the group known as the alkaline earths. The alkalies usually used are:—Soda (oxide of sodium) and potash (oxide of potassium) and the alkaline earths: lime (oxide of calcium) and oxide of lead.

Silica (oxide of silicon, a non-metal analogous in many ways to carbon) occurs in Nature as flint, quartz, rock-crystal, and in various other forms. In the form of rock-crystal it is perfectly translucent, but excessively infusible, requiring the intense heat of the oxy-hydrogen blow-pipe to fuse it. If, however, it be heated with a proportion of either soda or potash, the melting point is at once lowered, and a vitreous transparent slag is the result.

But the compound thus formed is quite unable to perform the ordinary functions required of a glass, for it is found to be soluble in cold water. On increasing the proportion of silica the fusing point rises, and the insolubility of the resulting compound increases; but a point is soon reached—still short of producing a serviceable glass—when the further addition of silica produces opacity. The combination of silica, then, with either potash or soda does not produce a glass of any value, but it is found that the addition of a small proportion of either lime or oxide of lead has the immediate result of raising the fusing point, increasing the insolubility, and at the same time retaining the transparency of the glass.

Thus glass is really an alloy of several silicates, and varies in character with the proportion of its different ingredients. Lime exercises the greatest influence in increasing the hardness of glass, oxide of lead produces a softer but a more brilliant variety—crystal and flint glass.

In addition to the different kinds of white glass, we have coloured glass, perfectly transparent, and now attainable in almost every conceivable tint.

We have seen that ordinary white glass is a compound of silica with one or more oxides belonging to two different groups—the alkalies and the alkaline earths; if now to these materials there be added a small proportion of certain other oxides, colours are transmitted to the glass without in any way interfering with its transparency.

Thus an oxide of cobalt produces that intense blue familiar to every one in the painted windows produced just anterior to the present-day revival of stained glass. The very striking purple, too, and the vivid greens depend chiefly on the oxides of manganese and chromium respectively for their tints. The magnificent rubies produced at the present time owe their rich colour to the suboxide of copper, while the oxide of gold produces a delicate rose pink.

The bottle-green colour of the various "whites" used in a stained glass window is obtained by the use of oxide of iron, and all the varied tints which our modern church windows can boast are produced by the use of various oxides or mixtures of oxides heated with the pot metal to various temperatures.

Ordinary glass is very feebly affected by water, but prolonged exposure to moist air so acts on glass, especially on highly alkaline varieties, that the surface becomes clouded and obscure. This effect may be readily seen on most of the more ancient stained glass windows of our churches and cathedrals. The surface frequently presents an appearance of minute pin-holes, and occasionally examples may be met with where the disintegrating influence of the atmosphere has taken place to such an extent that portions of the glass may be crumbled between the fingers.

Acid.	Alkaline.	Earthy.	
		Colourless.	Coloured.
Silica. (Oxide of silicon)	Oxides of Sodium, Potassium.	Oxides of Calcium, Lead.	Oxides of Iron, Manganese, Copper, Cromium, Uranium, Cobalt, Gold.

2. *Painting Colours.*

The process of glass painting really consists in establishing upon the surface of the glass layers of some opaque substance in varying degrees of thickness, thereby producing variations of light and shade. The opaque medium almost invariably now used consists of oxide of iron mixed with some soft variety of glass, which, melting at a heat which is only sufficient to raise the glass on which it has been painted to redness, binds the opaque oxide firmly to the surface of the glass.

Two oxides of iron are in general use; the red sesquioxide (occurring in nature as an earthy form of red hæmatite), which is chiefly employed for outlining, and the brown hydrated sesquioxide (brown hæmatite or limonite), used for the subsequent painting.

Of course, almost any opaque oxide might be used to serve the same purpose, and oxides of manganese, cobalt, copper, and iridium have been employed at various times; the chief advantage of the iron oxides being their rich colour.

The flux or glass with which they are in

mately mixed consists generally of oxide of lead, oxide of potassium, and silica.*

3. *Stains and Enamels.*

The yellow stain is almost the only colour that is now applied to painted glass in this country. Enamels, it is true, are occasionally used for small heraldic work, but they are usually opaque and ineffective, and are regarded as illegitimate by most glass-painters. Many painters still observe the custom of shading hair with a mat tint of black or brown, but in this case it is not an enamel that is used, but a coating of some painting colour that by the thinness of its mat is semi-transparent, and thus transmits the colour of the oxide employed in its manufacture.

The yellow stain, which is perfectly transparent, and may be varied from a rich orange tint to a pale lemon colour, depends for its colourative action upon salts of either silver or antimony. Antimony is now almost universally discarded in favour of silver, which if properly used, may be made to produce any gradation of tone.

The silver salt employed is the chloride, and as the clearness and delicacy of colour of the stain depends on the purity and cleanliness of the silver salt, great care should be exercised in its preparation. It is best prepared in the following manner :—

An ounce of fine silver is placed in a basin—or, better still, a large evaporating dish—and about a quarter of a pound of strong nitric acid poured over it. The basin is then placed in a warm situation (the hob of an ordinary fireplace is very convenient, and the acid fumes will then go up the chimney), and a little more acid added from time to time until nearly the whole of the silver is dissolved. It is next necessary to make a saturated solution of common salt ; this is prepared by simply adding as much salt to a jug of hot water as the water will dissolve. When the superfluous salt has settled down, and a clear solution has been obtained, the solution of silver in nitric acid (nitrate of silver) must be transferred to a large basin and diluted with several times its own bulk of hot water. The clear salt solution is then slowly poured in. A copious white precipitate immediately begins to fall ; this is chloride of silver, the silver salt that is employed in staining glass. After the whole has been stirred carefully with a strip of glass the precipitate is allowed to settle to the bottom of the vessel, and a little more salt solution added until no further precipitate falls. When this point has been reached the chloride is allowed to settle as before, and the supernatant liquor poured off ; the basin is then filled with hot water, the precipitate thoroughly stirred up, allowed to settle, and the water poured off. This is for the purpose of washing the silver chloride, and the operation is repeated until every trace of acid and salt has been removed from it. The precipitate is then transferred to a smaller basin, covered over with a sheet of paper and placed in a warm situation to dry. When dry it is best kept in a blue glass bottle, away from the light.

The silver chloride is usually mixed with ordinary yellow lake (two to three parts by weight of the lake to one of the chloride, according to the strength required), but the lake has, of course, no colourative action, but merely serves as a medium to convey the silver to the surface of the glass.

Enamels are simply varieties of soft glasses coloured with metallic oxides, as already described. The coloured glass is ground to powder, mixed with some medium and applied to the glass ; but the particles seldom properly fuse together, consequently a dirty opaque appearance is the rule, and purity and transparency of colour very much the exception.

4. *Firing.*

The operation of firing the painted glass in kilns is an exceedingly important one, since all the skill and care of the painter may be easily undone or disfigured by a careless or unskilful kilnman.

It has been stated that it is necessary to heat the glass to just that degree of heat at which the flux shall melt and bind the opaque oxide to the softened surface of the glass. If the glass is heated short of this, a raw appearance is observable, and the oxide, unprotected by its casing of flux, will, in a comparatively short time, flake off. On the other hand, if the heating be carried too far, an important change takes place ; the surface of the glass actually becomes in a molten condition, and attacks the iron oxide of the colour, the silica of the glass combining with it to form a transparent silicate of iron, and thus the density of the painting is very much reduced—may, in fact, if the heating be carried very far, almost entirely disappear. These facts, taken in connection with the differing hardnesses of different glasses, will serve to show how delicate an operation the firing really is, and how necessary it is that it should be superintended by a skilled and intelligent workman, and not left to the care of a mere labourer, as is too often the case.

In this connexion it is well to mention a condition in the fired glass often brought about by an unskilful kilnman, and known as "sulphuring." The painted surface has a black, metallic appearance, and the glass becomes clouded and opaque, and is frequently, for this reason, quite spoiled. This phenomena is attributed—as the name given to it implies—to the presence of sulphur in the fuel, but is, as a matter of fact, due to the reducing action (the lead in the flux being reduced) of the products of combustion present in the kiln. This may arise from two causes—either the kiln has not sufficient draught to completely burn the fuel and carry off the products of combustion, or the combustion is retarded through mismanagement of dampers and neglecting to clinker the fire-bars. This latter is almost invariably the real cause, and a neglect in this direction should be suspected whenever sulphuring makes its appearance. G. E. W.

* A glass closely corresponding to the formula :—K_2O, $Pb\,O$, $4\,Si$, O_3.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

DOMESTIC ARCHITECTURE IN THE EASTERN STATES OF AMERICA.

A SPECIAL general meeting (business) of this Institute was held at No. 9, Conduit-street, Regent-street, W., on Monday, Mr. H. L. Florence, Vice-President, presiding.

The resolution passed at the special general meeting held on the 4th inst., suspending By-law 26, to allow of the present President's term of office being extended for another year, was duly confirmed.

The Lords of the Privy Council having raised certain objections to ambiguities of wording in the additions and amendments to By-laws 30 and 9 as resolved upon at the special general meetings respectively held on June 14, and November 13, 1897, such additions and amendments were altered by the meeting as follows :—(*a*) By-law 91—Provided always that when the Council of the Institute receive a unanimous recommendation formally submitted by the Council of any allied society that a practising member of the profession is eligible and worthy of being elected as a Fellow, the Council shall, during the five years from the date of approval of this provision by the Privy Council, have power to elect him, if in their opinion his work be of sufficient merit. The Council shall also have the power to elect annually to the Fellowship without ballot the President or President-elect of any or all of the allied societies who may be eligible and apply for admission. (*b*) By-law 30 :—To alter the words in the antepenultimate sentence "the said meeting" to "the close of the last general meeting in June."

To alter in the last sentence of By-law 31 the word "first" to "last."

The twelfth general meeting (ordinary) was then held.

The Chairman announced that Signor Giampietri, one of their latest honorary members, had presented the Institute with a water-colour drawing of the Stylobate of the Temple of Antoninus and Faustina in the Forum at Rome.

Mr. A. N. Paterson then read a paperentitled "A Study of Domestic Architecture in the Eastern States of America in the Year 1896, with special reference to Questions of Plan, Construction, Heating, Drainage, &c.," of which the following is an abstract :—

In opening his subject, Mr. Paterson said that the first colonists carried with them to America not only the language, the laws, and the flag of the old country, but its architecture also. In what was known as "Old Colonial" would be found reproduced, with such modifications only as ensued from the adoption of wood instead of brick or stone, the buildings of the time of Queen Anne and the first Georges. Influenced, however, by new conditions of climate, of materials, and of class relations, and impelled by a constant and steadily increasing influx of wealth and demand for comfort, America had produced a type of house characteristic and original. From an artistic point of view, the best examples equalled, if they did not surpass, the highest standard of work in Great Britain ; while as regards convenience and comfort, the type was superior to that common in England, and one from which English architects might learn much. Having shown that climatic conditions were responsible for the open type of plan characteristic of the American house, Mr. Paterson referred to a few of its more distinctive features—the cellar for the heating apparatus, which also had an important part in determining the scheme of drainage ; the complete system of heating, reducing draughts to a minimum, allowing double doors of extra width to be wide open, and leading to the almost universal adoption of sliding doors ; the effect of spaciousness, even in small houses, due to the large hall and open doors ; the verandahs, which had greatly developed in suburban and country residences, and become a characteristic feature in plan and elevation ; the bedroom "closets," or receptacles for wardrobes, chests of drawers, &c., the heating system rendering the bed-chamber available as a secondary and independent sitting-room or snuggery, folding beds being largely used ; the service-rooms, a marked feature of the American plan, less isolated than in the English house. Types of town houses were then referred to in detail, the lecturer selecting examples of the self-contained residence. The houses of the wealthy conform more to the European model, with American characteristics confined to matters of detail. Appreciative reference was made to examples of self-contained residences at Washington, in which the art of planning is admirably exemplified, the awkwardness of the site being turned to advantage, with due regard to the scale, proportion, and symmetry in the disposition of the apartments. Here, too, brick, the material of the country, has been employed in a natural and simple manner, with commendable reticence in design. The lecturer then followed with a description of apartment houses in New York, their appointments, rents, &c. ; workmen's houses, with which New York is but very poorly provided ; suburban houses, dwelling particularly on an example at Brookline, of which a complete set of plans was exhibited ; and various types of country houses and summer resorts. In his observations on construction and materials, which were treated at considerable length, the lecturer referred to the steel-framed construction, so largely employed in the tall buildings of the States, as exerting a very pernicious influence on the architects' art from the point of view of sound architecture. Buildings were constructed on the principle of a steel cage, divided horizontally into layers, with no internal supports to speak of, and the whole sheathed with an apparently—but utterly sham—constructional skin of granite, stone, brick, or marble. The stone corbelling under the projecting oriel, a constantly recurring feature, is, in nine cases out of ten, a sham. Window mullions, themselves probably formed of stone sheathing round a steel core, are carried by steel cantilevers bolted at the back into the girders of the floor below, and the correctly designed and jointed corbel courses with difficulty carry their own weight. The expense of stone was offered as an excuse ; yet the same house had its marble, mosaic, and hardwood finishings, at a cost ten times what would have sufficed for making the construction honest. For roofs, floors, and partitions, fireproof construction is now generally adopted in all important domestic work in the cities. The elaborately constructed brick and terra-cotta arches between the girders, common in England, are not used in the States for floors to be subjected to lighter strains. Floors with tension members are coming much into vogue. In the construction of flat roofs an extensive use is made, in combination with other materials, of "roofing paper" or felt, laid in several thicknesses and bedded in tar. Most commonly the outer skin is of copper, laid either directly on the concrete, or on wood and felt, in sheets 12 in. by 24 in., and with soldiered joints. Partitions are commonly built of hollow blocks of porous terra cotta. Tiles of similar type are used for casing structural steel work, and in some cases instead of lathing on the internal

wall face. Thin fireproof partitions, finishing from 1¾ in. to 2¾ in. in thickness, are much in favour from the saving of space affected. These are mainly constructed by using channel or flat bars with expanded metal lathing or burlap between, plaster with hard-setting mortar on both sides. Some interesting particulars having been given of methods of construction in vogue for country and suburban houses, the lecturer went on to discuss the various systems of heating employed, observing that Americans regarded our system of open fires with something of the same feelings as we did the apathy of some of the more outlying countries of Europe and the East concerning modern ideas of sanitation. Nevertheless, the fireplace is as general a feature in American as in English houses, serving as an effectual ventilator, and valued for its cheerful appearance and the decorative character of its surroundings. Steam, hot water, and hot air are the means of heating mainly employed; the two former being much the same as used in public buildings in England. Warming by hot air, essentially applicable to small areas, and almost unknown here, is practically universal in the States for all houses costing about $6,000 (£1,200) or less. In the smaller class of city houses, in apartment houses, and hotels where the limitations of space render a multiplicity of air flues embarrassing or impossible, and where its superior cheapness is of importance, direct radiation, either by steam or hot water, is universally adopted. In the more luxurious and expensive city houses indirect radiation is the invariable system. In the largest mansions the assistance of an electrical or steam-driven fan is invoked to regulate the distribution of the heated air, which is also screened and moistened as required. In treating of these methods of heating, after a brief reference to one or two special forms of installation, the lecturer dealt more fully with the hot-air system as being least known in England, illustrating his description by diagrams of the apparatus, the furnace, cold-air supply, and hot-air flues. In matters of plumbing and drainage, which were next discussed, and described in minute detail, the lecturer said America had made great advances and was far ahead of England. This progress was mainly due to the stringent laws adopted by the city "Boards of Health," and rigidly enforced. Before building, complete sets of plans and sections showing plumber work and drains, to the scale of a quarter of an inch to the foot, had to be deposited with the Boards. On these the nature and positions of every fitting, pipe, and trap must be clearly indicated. Draft specifications, some clauses from which the lecturer summarised, are issued by the authorities for the guidance of architects. Two main characteristics are apparent in this class of work—viz., the openness of everything, and the substitution, along with cast-iron for fireclay drains, of wrought-iron and brass for lead in the supply and smaller waste pipes. The lecturer closed with a description of the "Waring" system of sewage disposal for isolated houses and small communities, which is employed very generally throughout the Eastern States, and with entirely satisfactory results.

Professor Kerr, in proposing a vote of thanks to Mr. Paterson for his paper, said that it would be impossible that night to discuss the great mass of details which he had furnished with reference to the internal contrivances of American houses. Keeping himself strictly to the plans, he had to point out that there were several national characteristics and peculiarities affecting those of American houses. In the first place, there was the question of climate. Now, it must be apparent to any one that in the United States of America there are a great many more climates than one. This would remind those of them who had studied Richardson's designs of this suggestion that, without originating novelty, Richardson mainly adopted the characteristics of the South and applied them to the eastern counties. Another important question was that which the lecturer had mentioned under the phrase, "the difference of class relations." The relations between master and servant as they exist in Europe did not exist in America. There the servant considered himself as good as his master, and, in some instances, a great deal better; and the maid told her mistress the same with the utmost satisfaction. That created a difference of social discipline as compared with what exists in this country, which was of the utmost possible importance. What the lecturer had described as his (the speaker's) dictum, that there should be a separation between the two families—the family properly so called and what he called that of servants—was not his dictum at all. It was the universal doctrine which pervaded the gentleman's house in this country, and which was carried out by Mr. Burn, who was historically the prime minister of plan. There was another peculiar characteristic about the Americans which was not easily explained, viz., their fondness for hotel life. It was not that they preferred to live at a hotel or go out of their way to live in one, but the way in which they occupied their houses was very much like hotel life. There was an element of deception observable in some of their plans. He took as instances the plans of the two houses in Maddison-avenue, in New York. One house was very large, evidently intended for a gentleman, an American of considerable wealth, determined to exercise his right to have a display. The whole length of the house from back to front—it was the corner one—was occupied by a dining-room at one end, a reception-room next, then what was called a *foyer*, next another reception-room, and the drawing-room in front, a magnificent staircase being placed in the middle of the whole series of rooms. These constituted a single suite—a processional suite by wide folding doors. That would not do in this country. The only other case of the kind that he knew of was the house of the gentleman who told him that he wished his house designed in a very peculiar way. It was to be perfectly comfortable for a small family according to English tastes, but was to be so arranged that it could be thrown open upon occasions into one suite for receptions. The gentleman to whom he referred stated that people were good enough to invite him out a great deal and that this was the only way he could return the compliment. But the gentleman in Maddison-avenue had sacrificed the comfort of his house entirely. He had not done it in the French but in the American manner, from which he thought they in London could derive no suggestions. Upstairs, again, he had a similar suite. A magnificent staircase, a large pretentious hall, a library, a card room, and billiard room, the whole forming one grand suite. He had two reception suites, and nothing else in the house. Then there was a little house of which their friend had spoken with very great approval. He call it an exceedingly badly planned house, and one which was uncomfortable to English notions. Then there was the matter of sliding doors, on which the lecturer laid some considerable stress. How would the people of this country like to push aside and march through such doors? It would not do at all. That was the hotel life of which he spoke. The American liked to live in his own house as in an hotel. That was the Latin way of living. The Latins founded their house on the open court without a roof. The Goths founded it upon the confined and enclosed plan. The Americans, differing from us as regards climate, accepted the Gothic idea, but they got the Latin principle introduced, and it was in this way their peculiarity in planning arose. Another peculiarity of theirs which was worthy of notice was the bedroom closet. That would not do in this country; it would get stuffy, and the dust that would come out of it from one's clothes, the portmanteau, and such things, would be most unpleasant. That was declared, and he believed properly declared, to be a *sine quâ non* of the American house. Then there was the folding bedstead:—

"A bed by night, a chest of drawers by day."

Was that, he asked, a desirable thing? There, again, was evidence of the hotel life. The occupant of the bedroom under the conditions mentioned had no privacy such as we had. The privacy of the bedroom pervaded all the country houses in this country. One plan submitted to them was well worth studying—that of a house at Shamrock Cliff, Newport, the one with two slanting wings. One of its curious features was what was really an open shed of an ornamental character, in which the inmates could accommodate themselves in the sunshine or on pleasant evenings upon a veranda, from which, of course, we in this country could get some suggestion. Then there was the tenement house, of which a plan was exhibited, and which he thought a very faulty plan. Apparently they went in by the door and fell into the kitchen. Then, if they went upstairs, they would find a parlour and the hall. The idea of the hall being upstairs! The Americans did not make the same use of the hall as we did, but that was because they did not know better. There were houses in this country where the hall was made a feature, and this had been greatly developed in the towns. The hall was intended as a rendezvous, not as a mere passage, and when a hall was made for that purpose, as well as a lounge, it added immensely to the comfort and convenience of the residents of the house. The Americans did not seem to manage things properly. They made the whole of the house a string of doors, and these they kept open. That was contrary to English notions of comfort and convenience. In regard to servants, though some difference of arrangement might be required according to American ideas, he still maintained there ought to be two divisions of the family. What he had always contended was that the servants were entitled to their own privacy just as much as the family.

Mr. Statham, in seconding the vote of thanks, said that the paper would prove most useful to them when they got it printed with some of the diagrams. There were one or two points on which he would like to touch, and which were typical of the American house, and with regard to these, while a great deal of what Professor Kerr had said was perfectly true, he could not help thinking that the study of the American plans would give them suggestions for getting a little way out of the ordinary course of house planning. It was a question whether, with the more scientific system of heating now available, they could not give to smaller houses a greater appearance of space and dignity than they were able to give them by their ordinary system of cutting them up into closed rooms. He might say that something of the American house idea had been carried out no further off than Wimbledon Common, by a great English painter. The gentleman he referred to planned it himself on a kind of cathedral plan, in which the hall was the nave, the drawing-room took the place of the chancel, and the study and dining-room constituted the transepts. The whole was heated by hot-water pipes, and the various portions could be shut off at pleasure by drawing curtains. This formed an interesting variety of house plan, and it had the advantage of giving to an ordinary sized dwelling-house an appearance of spaciousness which could not be obtained on the usual English plan. In the summer time the inmates could roam about the house instead of being shut up in one room with the door closed. This was a suggestion well worth considering, and it was arrived at by the owner, he believed, quite independently of American suggestions. Besides this point of leaving the house more open there was also a great deal of suggestiveness and originality in the American plans; for instance, in regard to the shape of the rooms, the Americans did not confine themselves to squares and parallelograms as we generally did; they introduced frequently oval or circular rooms, shapes which were not in every respect the most convenient, but which presented great opportunities for variety of architectural effect and treatment.

The motion having been carried unanimously,

Mr. Paterson offered a few words in reply. He wished it to be understood that he did not bring forward the American plans with the view of putting them before English architects as superior to what they had been accustomed to. He made them the objects of his study and brought before them the results of his study, leaving it to them to reject or accept them as they felt inclined. On the matter of openness of plan, he had tried to show that this was a national characteristic which was partly suggested by the system of heating the whole house. A house being equitably warmed, there was no necessity, unless for privacy, for doors. Publicity was foreign to the tastes of Englishmen, and in so far as spaciousness and openness was disagreeable to them they were at the same time of some advantage in the treatment of smaller houses. With regard to the bedroom closet he had to say that when kept properly clean, and with a window, it was distinctly a desirable addition to the house for the storage of linen or a portmanteau. As to the folding-bed he had to point out that this was only to be found in the poorer class of house.

The proceedings then terminated.

LESSONS FROM FIRE AND PANIC.*

IT is a question whether danger from fire is not increasing in spite of Building Acts. Our buildings are getting more lofty, more closely packed together, and more thickly inhabited. In commercial buildings the rooms are larger and more encumbered with goods, amongst and over which manufacturing processes are carried on. There is more machinery actuated by heat. The timber we use is more easily combustible, fittings are lighter, and everything is kept warmer and drier. All our arrangements for obtaining light, from the lucifer match to gas and mineral oil and electricity, are novel and productive of new dangers. The proportion of window openings to wall space is much increased, and with the growth of honesty outside or trustfulness within, shutters have been abandoned. The old-fashioned solid window frame that stood flush with the face of the wall, and, being dangerous, had to be abandoned, is through modern fashion being brought out again from its reveal and made in thin casing which will catch fire and fall into the street. Lifts going through several stories neutralise the advantage of fire-resisting floors, lighting areas common to different premises do away with the security of the party-wall. Unrestricted skylights bring ridicule on the incombustible roof covering of the Building Acts. In fact the most scrupulously legal building of brick or stone and slate may be no more than a kind of grate in which its internal structure and its contents can be most conveniently burned. So in the Cripplegate fire, the progress was about as rapid, and the destruction over its limited area no less complete, than in the Great Fire of 1666; and if our arrangements for the extinction of fire had not made immense progress this recent event might have rivalled that great calamity.

Our own lesson from this must be to improve by all means the construction and arrangement of buildings, even though we may be in advance of Building Acts. We cannot widen the streets, nor increase the unoccupied areas, nor reduce the necessary openings for light, nor dictate to the trader modes of conducting his business which would make his business impossible, nor can we do much in advance of public opinion to diminish the numbers of an audience or spread them over a larger area. The most that we can do is to diminish the chances of fire and to delay its progress, to prevent its passage from room to room and from house to house; to so arrange the construction that a fire may be more easily put out; and as regards the safety of the inmates, to provide the best means of escape. . . .

The points which I think most useful to notice are the following:—

1. The structure and arrangement of buildings generally.
2. Certain legal and other provisions for preventing loss of life in dwelling-houses.
3. Certain legal and other provisions for preventing loss of life in factories.
4. Certain legal and other provisions for preventing loss of life in public buildings generally.
5. Certain legal and other provisions for preventing loss of life in theatres and music-halls.

With respect to the structure, the party-wall as a separation between buildings is, I think, effectual if no illegal openings are made in it. Whether or not it need be carried up through the roof has been a question, but no satisfactory evidence seems to be forthcoming as to the stoppage of fire by party-walls that are not so carried up. When the London Building Bill of 1893 was before Parliament, the Committee took a great interest in this question, and decided that the old height of 15 in. above the roof should be raised in the case of a warehouse to 3 ft.

As to openings in external walls, where the streets or back areas are narrow, we want shutters that will delay the passage of fire from without, if only for half an hour, and will obstruct the passage of fire from within. It may be that fire-resisting blinds occupying little space will be found useful. The common lighting areas are formed by what are supposed to be external walls, and the provision of shutters or blinds to the openings in them is even more necessary. Every contrivance of this kind should be easily closed, and should be actually closed every night.

I am quite unable to understand the slow progress made in this country by the fire-resisting floor. In Paris fire-resisting floors were common five-and-thirty years ago. I was then carrying out such work here on a large scale, but the case was exceptional; the weight of the floors was great, the walls had to be thickened, and the cost was excessive. Cheap steel and light substitutes for concrete have changed all that.

In the Cripplegate fire, although many of the warehouses were modern, and some had already been burnt out once or oftener, there was not a single fire-resisting floor. There were wooden floors carried on iron girders, but we are familiar with the behaviour of wrought-iron girders under such conditions. They expand and contract so as to overthrow the walls, or they become soft so as to hang down like tapes. There are now available fire-resisting floors in great variety, in which the iron is more or less protected from the fire. In using them care must, however, be taken that no leakage of gas can accumulate in any hollow spaces. I have seen a large and handsomely decorated house in which fire-resisting floors were used in conjunction with battened walls. Upon applying a light in the usual way to the suspected point of escape, the mixture of gas and air accumulated in the hollows exploded, and the ceiling with the wall battening in two stories was stripped away, littering the floors and mixing with the broken window glass. In that case there were also severe personal injuries.

In the great re-housing schemes of the London County Council, I have made every floor fire-resisting by the use of steel joists wide-spaced, and filled in solid with coke breeze concrete, upon which the floor-boards are nailed, the plastered ceiling being done under the concrete direct. The cost is no more than that of a good wooden floor, while the total thickness is only 7 in., which saves 2 in. or 3 in. in the height of each story. They are not complained of by the tenants in respect of noise, but in a house where this would be of great consequence a cork covering to the boards under the carpet would be a sufficient remedy.

If it is necessary to adopt wooden construction for floors, the ordinary pugging should at least be used. Joists of double the usual thickness placed 2 ft. apart, and filled in solid with some form of concrete, would offer great resistance to fire. As to the material for pugging, coke breeze and cement concrete, mixed four parts to one, stands fire and water better than anything else. In Switzerland they use coarse plaster stuff, into which long wet shavings have been stirred as hair is stirred into plaster for ceilings; and this, though an imperfect substitute for concrete, will resist a fierce fire for a considerable time, but more experience is required in the use of light solid materials.

I think we are now arrived at a time when architects at least should try to secure an incombustible roof. This is stipulated in the building leases of some very important London estates, and I am told that it raises no difficulty. If the space in the roof is wanted, pugging or concrete is sometimes put between wooden rafters. If a steep roof is necessary, sheets of asbestos put in the roof boarding in place of felt will afford some protection. In a building professing to any degree of fire resistance the roof should be protected by a ceiling of concrete put over the topmost story. Ceiling on perforated or expanded metal will give some protection against a small fire.

As to partitions, lath and plaster should be quite abandoned, and brick-nogging also, for a half-brick wall in cement is as easily constructed. There are many kinds of thin partitions from which to choose. I commonly use coke breeze cement concrete 2 in. in thickness, which is light, tough, and strong enough for stories of the ordinary height. Old lath-and-plaster partitions may be filled in with this material or with brickwork by removing the plaster from one side only. If the structure is otherwise fire-resisting, any wooden panelled partitions may be considered as fixtures and disregarded, particularly if in hard wood.

I mention these and similar details not as being unknown but as being too often neglected, even where the cost would not be a serious item. If fire-resisting materials were in more regular demand, workmen would become familiar with them and they would cost less. Exaggerated estimates of the cost of fire-resisting construction do much harm. Very important steps can certainly be taken in that direction with very little extra cost on ordinary construction.

The great danger of a staircase arises from the cupboard underneath its lower flight, which will probably be stored with combustible materials. If it is constructed of thin deal it will take fire easily. If more solid, or made of hard wood, it will resist a small fire for some time. If it is to be fire-resisting, concrete is safer than stone. But if everything about a staircase is incombustible it may be rendered useless by accumulated smoke arising from such a cupboard as I have mentioned, or from an adjoining room.

There are certain precautions necessary in construction whether the materials are fire-resisting or not. I have already suggested the danger of hollow floors and hollow partitions, but all hollow spaces that can contain gas or transmit flame or inflammable vapour, or will even allow a supply of air to pass towards a fire, are highly dangerous. The lining of walls with matchboarding is the most ordinary case of this kind. By means of it fire communicates instantly all over a shop, and up through the floor to the rooms above. The hollows formed in heavy plaster cornices and the hollow spaces behind skirtings transmit flame or inflammable air without any outward warning to adjoining or even distant rooms. One instance or two will illustrate this.

In a fire near Clapham Junction that originated amongst the Christmas decorations in a draper's window, the smoke and flames passed in this way to the upper floor so quickly, that two girls at work over the back part of the shop lost ther lives, although there was an easy means of escape by getting out of the back window on to a flat. In a similar case several persons, probably seized with panic, jumped from first floor windows into the street, instead of stepping out at the back. These are indications of the quick effect of fire in a badly constructed building.

As to the passage of fire or inflammable vapour by hollow spaces, cases have happened where the origin of a considerable fire was inexplicable until it was traced back to some source at a considerable distance from the scene of the damage. In a "fireproof" building, a workman hung his coat in a cupboard leaving his pipe in the pocket. The coat took fire and fell, setting light to the skirting, behind which a small hole had been left in the brick internal wall. The floor-boards of the adjoining room had been laid on wooden strips that stood above the surface of the concrete. The fire passed along the hollow space, doing three thousand pounds' worth of damage in this fireproof building. Unless the elasticity of a floor is an object, the boards should be nailed down on to a surface of coke breeze concrete.

If no more serious measures than those I have described are taken in respect of a purely domestic building, they may give very material security as to its behaviour in case of fire. For many years past companies have been erecting artizans' dwellings in London, one of them having put up blocks containing nearly six thousand tenements. In only one case has a fire extended from one tenement to another. This is due to generally careful construction, though there has been no rigid adherence to the principles of fire-resisting principles.

In these descriptions of the parts of a fire-resisting building the work of the carpenter is practically excluded, and there are many buildings in which this principle should be carried out. There is, however, much convenience in the use of timber, and, if posts and girders are made in large sizes, they are safer than if made in iron. Solid floors made of deal joists set close together withstand fire for a long time, but are ultimately destroyed by great heat.

Many attempts have been made to render fir timber fire-resisting or slow-burning by chemical treatment or by covering it with paint. Some of these applications are useful when applied to textile fabrics and to thin slips of wood, but I have been unable to meet with any process that renders the mass of a joist or beam fire-resisting throughout. This is a matter well worth further inquiry and experiment, for joinery at least might be protected in this way. As to the public experiments sometimes reported, those in which tar or mineral oils are liberally used are untrustworthy, for these are light-giving and smoke-producing liquids, and do not imitate the conditions of an ordinary fire.

Although we may succeed in rendering new buildings satisfactorily fire-resisting, a much

* A paper read by Mr. Thomas Blashill, architect to the London County Council, at the meeting of the Surveyors' Institution at Manchester on Wednesday last.

more important question for the present generation is the improvement of the condition of old buildings. This is well worth the attention of those who have the charge of building estates already covered, of ordinary town property, or of those old historic mansions filled with family treasures, one of which as I write has been added to the number of those wrecked by fire. In an ordinary building, purely domestic, if the joists are not strong enough to carry a filling-in of concrete they will carry ordinary pugging, and if no more than a breadth of 3 or 4 ft. all round a floor is well filled in on some fire-resisting system, every hollow behind adjacent cornices, skirtings, and partitions being carefully stopped, a very considerable amount of resistance to fire will be afforded. If besides, the points of contact between chimney stacks and floors and roofs be examined and timber cut away, the condition of an old house might be made approximately as good as that of a new building. In certain cases, where a domestic building is changed into a public building, and where a building partly domestic and partly used for trade is increased in area, under the London Building Act something of this kind has now to be done.

Even more important than these details of construction is the question of arrangement of buildings with the view of preventing loss of life from fire. Warned by frequent disasters, the legislature has from time to time made provision for protecting persons from sudden fire and panic, and for insuring to the inmates of certain buildings reasonable means of escape.

Examination of this kind must be thorough, for it is difficult to exhaust the possibility of mischief caused by careless workmen in old or in modern times. I have found in an old house the brickwork of a chimney breast cut away to enlarge a cupboard, a thin board being substituted, which had evidently done duty for years in that position.

And with regard to any building, the architect cannot be too cautious against assuming that reasonable care will be taken in managing it. Most houses are at times, often for a very long time, left in the hands of people without any sense of responsibility. That is an additional reason for making every structural provision against the chance of a fire. The fate of Cowdray House, in Sussex, though the story is a hundred years old, contains nothing that might not now be paralleled.

The mansion, which was one of the grandest in the country, was being repaired and decorated in preparation for the owner's wedding, and it was left in the hands of caretakers and workmen. All the more valuable of its contents were temporarily stored in a gallery, and a room close to this place was selected for the carpenter's shop, the fires being closely surrounded with shavings. During the night on which all was finished fire was observed in the workshop. The neighbours assembled. The moat was full of water, but nobody could find the key of the engine-house. The destruction was practically complete.

The London Building Act, 1894, provides by Section 61, that every building over 30 ft. in height used wholly or in part as a dwelling-house or factory, *and having a parapet*, shall have a dormer window or door opening on to the roof, or a trap door with a fixed or hinged step-ladder leading to the roof, or with other proper means of escape. If there happens to be no parapet there is no such provision. I venture to think that it would only be ordinary prudence to make this provision in any house or factory where there is reasonable doubt as to the means of escape by the ordinary route. Section 62 partially meets this view by requiring that any story in the roof, the floor of which is over 60 ft. above the street, shall be constructed of fire-resisting materials; and Section 63 provides that every building over 60 ft. high shall have on the stories, where the floors are over 60 ft. above the street, "such means of escape in the case of fire for the persons dwelling or employed therein as can be reasonably required in the circumstances of each case." No such stories can be occupied until the London County Council certifies that this has been done. This is new legislation, and it has now become a very important part of the duty of the Council to say what can be reasonably required in such cases.

The height of 60 ft. is fixed because that is the greatest height to which a movable fire-escape will reach, and without some special provision the only means of escape from these high stories would be by descending, if that were possible, to the lower stories, and increasing the number of persons there in peril. Schemes to be applied to lofty hotels and houses more or less crowded at night have come before me in great variety, many of these very inadequate. It seems clear that the law, which leaves the occupiers of floors up to 60 ft. in height to take their chance, intends that those on higher floors shall escape. They may have a gallery or an iron ladder or staircase for access to the roof of an adjoining building, or a series of ladders may be contrived that will conduct them clear of the windows of the burning building down to the ground. But 60 ft. is a great height from which to expect women, children, and sick persons, scantily dressed, suddenly alarmed in the night, and for the first time in their lives, to descend by an external ladder, in any weather, and probably in the dark. We may realise the condition in which people escape from the account of a fire that happened at the Scottish mansion of the Duke of Argyll, in which praise was given to the Princess Louise for her presence of mind in running back from the garden to get stockings for the rest of the household who had rushed out barefooted. For people in that condition steep ladders with ordinary rounds are useless. They must be of tolerably good slope, have flat treads and hand-rails, and there must be suitable protection where necessary against falling into areas or through skylights. The escape door must have such fastenings only as can be easily opened from within. It must be easily found by night, and the bottom of the escape must be in some open space quite clear of danger. But whether the escape delivers to the ground or on to some willing neighbour's roof, there is risk that it will be made use of by burglars and by inmates of both premises for improper purposes. If a separate staircase leading down to a separate door of exit is provided in the building it will very likely be allowed to go out of use, and will be turned into a store place for lumber. On the other hand, if the construction of dwelling-rooms above the 60 ft. limit is of very great consequence, the owner may reasonably be required to make and keep up such arrangements, however costly, as will be really efficient.

By the 74th Section of the London Building Act, when a building over 1,000 ft. in area is used in part for purpose of trade and manufacture and in part as a dwelling-house, the two parts must be separated by walls and floors of fire-resisting materials, and all means of approach to the dwelling-house portion must be constructed throughout of fire-resisting material. But the walls of staircases and passages may have openings fitted with fire-resisting doors to communicate between the two portions, for which purpose hard wood 2 in. thick is reckoned fire-resisting. For staircases, hard wood 2 in. thick is also permitted, and good concrete when filled in between the joists of floors is fire-resisting.

It will be observed that the term "fire-resisting" is used and not fireproof. The construction must not add fuel to the fire, but resist it for at least a considerable time, during which the inmates of a building may escape and fire appliances be brought to bear. If the contents of the room or even of the building cannot be saved, so much the worse for the owner or the insurance company; but the fire should rarely extend to the adjoining apartment on either side or to a story above or below, and the smoke should be kept from staircases and passages. This means giving to adjoining sections of a house as nearly as practicable the same protection against each other as a good party-wall affords to the inhabitants of an adjoining house.

By the Factory Act, 1891, every new factory in which more than forty persons are employed must be provided on the stories above the ground floor with such means of escape in case of fire as can reasonably be required under the circumstances of each case. Every old factory must, after notice, be similarly provided, subject to arbitration in case of difference. The Factory Act of 1895 extends these provisions to certain workshops and laundries. I think that the chief fatalities during recent years have been in factories employing less than forty, but there are other provisions for safety and for facilitating escape which may be put in force by the inspectors if the provisions above mentioned are not applicable. As to the application of these structural provisions, it has been said that if the workpeople on the upper floors are provided with means of getting to the ground floor they cease to be subject to the Act, but this view does not seem to be supported by the words of the Act, which require that such persons are to have "means of escape," and the ground floor might be on fire and not available for that purpose. These persons, therefore, must have means of getting clear of the building either into a street, or by arrangement on to adjoining premises, or into an open yard of ample area. In a confined yard they would be subject to the glow and heat of the fire, and this is fatal. Many of the victims at the Paris Bazaar fire died in the open yard at the rear, which was of some size, but which afforded no shelter from the fire.

The circumstances of each case which the authority or the arbitrator are to take into account appear to be such as arise from the nature and quantity of materials used, the processes employed, the danger from lifts which will communicate fire and smoke, the numbers of workmen and workwomen respectively, and the description of the premises surrounding the factory. It is sometimes argued that "the circumstances of each case" which are to be taken into consideration include such as arise from the insufficiency or inconvenience of the site, the owner's system of supervision, or other matters which might have been foreseen and provided against in the selection of the site or the construction of the building, and that allowances should be made for such matters of difficulty. But there must, at any rate, be means of escape, and those which may be sufficient in an ordinary case may reasonably be increased and not omitted if the site, or the buildings, or the system of management are worse than common. If a factory has combustible floors and roof, the requirements may be more stringent than if it is fire-resisting throughout. But unless the plan is satisfactory, the smoke from a very small fire will quickly spread, disabling the workpeople or causing a sudden panic, whether the building is fire-resisting or not.

Some of the causes of danger are the inflammability of the stock, the way it is allowed to accumulate, so that insufficient room may be left even for passages, the chance that access to staircases may be cut off by the fire, the insufficient width of the staircases, the bad arrangement of their steps, and their liability to become filled with smoke. As in theatres, there should be alternative means of escape at different extremities of the building. Two rooms may be united by a doorway, each room having its staircase at the other extremity, or two buildings having their own staircases may be united by a bridge on each floor. Generally the staircases should be of concrete, secondary staircases of minor importance being of oak or teak, the treads 10 in., the risers 7¼ in., the width 3 ft. 6 in. to 4 ft. 6 in. There should be a fire-resisting enclosure to each, with self-closing doors opening by pressure in the direction of each, but not so as to obstruct the landings. The staircase should be well ventilated and should adjoin an external wall. If that is impracticable, it should communicate with the street by a very short passage of fire-resisting construction. The roof of the staircase should be fire-resisting. If iron or other fixed sashes are to be used some should be made to open, so that persons could be rescued by means of them.

I will here allude to other means of escape which are no doubt contemplated. Iron external staircases kept clear of windows through which fire can pass may be constructed. Movable fire-escapes are to some extent recognised, for the factory inspector may require them and the magistrate may order them. But these are things properly within the duty of the tenant, and do not seem to be what the Acts require of the owner, whose duty it is to put his building into a proper state structurally. Movable escapes are not satisfactory as substitutes for structural requirements. When a new staircase was demanded in an old building the occupier pointed out that there was a movable escape ready to be let down at one of the windows. When asked to show how it worked, the window was found to be fastened down, and he proposed to send for a carpenter, who was in the basement. I need not enlarge on the risks of such contrivances when used by persons not in the frequent habit of using them.

Escape downward by means of the staircase being liable to interruption by fire and smoke, other means must be made available. Very little has so far been done to provide escape by the horizontal route towards adjoining build

ings or upwards through the roof. To both of these there are, however, serious objections.

The London Building Act prohibits openings through party walls between houses in different occupations; besides which, few people would run the risk of the improper user of such convenient modes of getting from house to house without the knowledge of the owners. The late Sir Henry Bessemer showed me an ingenious arrangement by which this last objection was sought to be removed. An opening only 16 in. wide by 3 ft. 6 in. high was made in the party-wall at a foot above the floor level. On each side was a very strong iron door and frame, on the inner side of which was a pair of knockers. On an alarm of fire in either house the inmates would open their own door, and ply the knockers on that of the neighbour, who might be expected to come quickly to the rescue. The outside balcony is a much better arrangement, and if it could be generally adopted on each story, or only for alternative stories, there would be in most cases reasonable facilities for rescue. But the balcony, though a beautiful architectural feature, is almost unused in this country. It might cause apprehension of improper access from house to house, or from room to room. I have, however, lived for many years in a district where every house has a spacious balcony above the ground story, and I have not heard of this objection. There is an easy means of passing from the window of one house to the nearest window of the adjoining house by fixing a short length of balcony between them, crossing the end of the party-wall.

But the best means of escape after the staircase is by way of the roof, a good flight of stairs being provided to the roof door, which should have an automatic fastening. The Cripplegate fire happened to originate in one of the manufacturing warehouses which was first dealt with by the London County Council under the Factory Act of 1891. The two upper stories were occupied by seventy or eighty workgirls, and the owner willingly put a proper door to lead on to the roof. By this route he and they got away; without it they must all have perished. But easy as it was, there was considerable difficulty in getting the girls out in the few minutes available, some having fainted or become uncontrollable in their excitement. As the workwomen are usually accommodated, often by hundreds, on top stories, this is a useful lesson in the construction of means of escape.

I do not suppose that roof doors will be willingly adopted where valuable stocks are kept, but in a district of warehouses where the roofs were properly adapted for escape there might be a watch kept on the roof against thieves and the outbreak of fire.

The construction and arrangement of public buildings, that is, places of worship, schools, hospitals, workhouses, theatres, halls, exhibition rooms, and other public places of assembly in London, are in certain respects regulated by the London Building Act, 1894. The general construction must be to the approval of the district surveyor subject to a tribunal of appeal, but the Act requires that the floors of lobbies, corridors, passages, and landings, and the flights of stairs shall be of fire-resisting material. Besides this the dimensions of passages, staircases, and exits of new churches, chapels, meeting-houses, public halls, lecture-rooms, exhibition rooms, or places of assembly are laid down in the Act. Staircases must be carried and enclosed by 9-in. walls, and with the corridors and passages shall be not less than 4 ft. 6 in. wide, but if not more than 200 persons are accommodated this is reduced to 3 ft. 6 in. If for more than 400 persons, an addition of 6 in. for every additional hundred is to be made up to a maximum of 9 ft., and when the width is over 6 ft. there is to be a dividing hand-rail. If two staircases or passages are put instead of one, each must be of two-thirds the above dimensions, but not less than 3 ft. 6 in. And if one portion of the public is accommodated over another portion they must have a separate exit. All doors and barriers must open outwards, and no outside locks or bolts are to be fixed.

As regards public buildings in general these are new provisions. They are a somewhat mild adaptation of the much more stringent regulations that have long been applied to theatres and music-halls, and they were very much required.

I was once asked by a member of a Parliamentary Committee who desired to ridicule our theatre regulations, why we did not seek to apply them to churches, and could only suggest the comparative infrequency of accidents in such places. But the reason was inadequate, and Parliament has since recognised this in the above provisions. There are many more accidents in places of worship than is commonly supposed, and the most serious have happened in such places. The crowds are often more dense, and precautions are hardly thought of. One or perhaps two doors are thought enough for many hundreds of people. The organ and the heating apparatus and vestry are in dangerous proximity, artificial light and decoration are on the increase. A senseless panic ensues on the least alarm.

To go back rather a long way, in 1120, the monastic church of Vezelay, in France, was burnt, with 1,127 men and women. And other similar fatalities are found in old records. Some seventy years ago, at a festival, when the cathedral of a South American city was crowded with the whole female population, the elaborate decorations which thoughtless people always add on festal occasions took fire, and 2,000 perished, hardly any escaping. A few months ago some decorations in Pisa Cathedral took fire, and in a panic twelve persons were crushed to death and twenty injured. A few weeks ago, fifty-four people were killed and eighty injured at a fire in a church in Russia. A few days ago, the organ and gallery of a chapel in Hull were blazing when the Sunday morning congregation assembled. If this outbreak had been delayed for half an hour we might have had an object lesson in panic. I mention these matters because the architect will feel that he ought not to provide anything less than the moderate securities demanded by the London Building Act; and if one or two additional doors are required, they are at all times a convenience to a crowded congregation. If the precautions above mentioned are required in a new building, I am unable to see why they should not within a reasonable time be demanded in old buildings as well.

But these are matters in which we must expect no help or sympathy from the persons whose lives are thus safeguarded. Twenty years ago the densely-crowded church of which I was the people's warden had outer doors opening inwards, and with the support of the vicar I insisted on an internal lobby with doors opening outwards. We did this, in spite of unanimous opposition, and as no panic has occurred the opponents may say they were in the right.

A few years ago a thoughtful architect provided to the west end of a new church the only efficient arrangement of exit doors that I have seen, but fitted them with a lock. I went to the opening service to see the result. The place was full even to the standing room, and when the procession from the choir turned to come down the centre passage, they could not advance a step. Then, if ever, was the time to throw open the exit doors; but the key was in the vicar's pocket, and he could not be reached except by means that would have been impracticable, and with delay that would have been fatal in case of a panic.

I think it probable that we may not again hear of the fitting up of one of our great churches for some important function with a forest of timber, in stages and seats and galleries, so that either through accident or through malice a fire may be raised which might result in a calamity even greater than any that has hitherto been known. At the induction of the Dean of Canterbury, when a great crowd was expected, those in charge of the Cathedral were properly careful, and limited the admissions to those who could be accommodated with a reasonable chance of safety to themselves.

Our theatre regulations are made under the Metropolis Management Amendment Act, 1878, and have been much strengthened in recent years, largely through the advice of Sir E. M. Shaw, K.C.B., formerly the chief officer of the Metropolitan Fire Brigade, while the application of the regulations has become more stringent as their necessity has been more generally appreciated. They are applicable to all places where the public are invited, for music, or dancing, or stage plays, whether on payment, or by ticket, or free. I can only mention a few of the things which must now be done in the case of a newly-licensed building, and which are demanded so far as is reasonable and practicable in the case of an old building. As to the latter there is an appeal to an arbitrator.

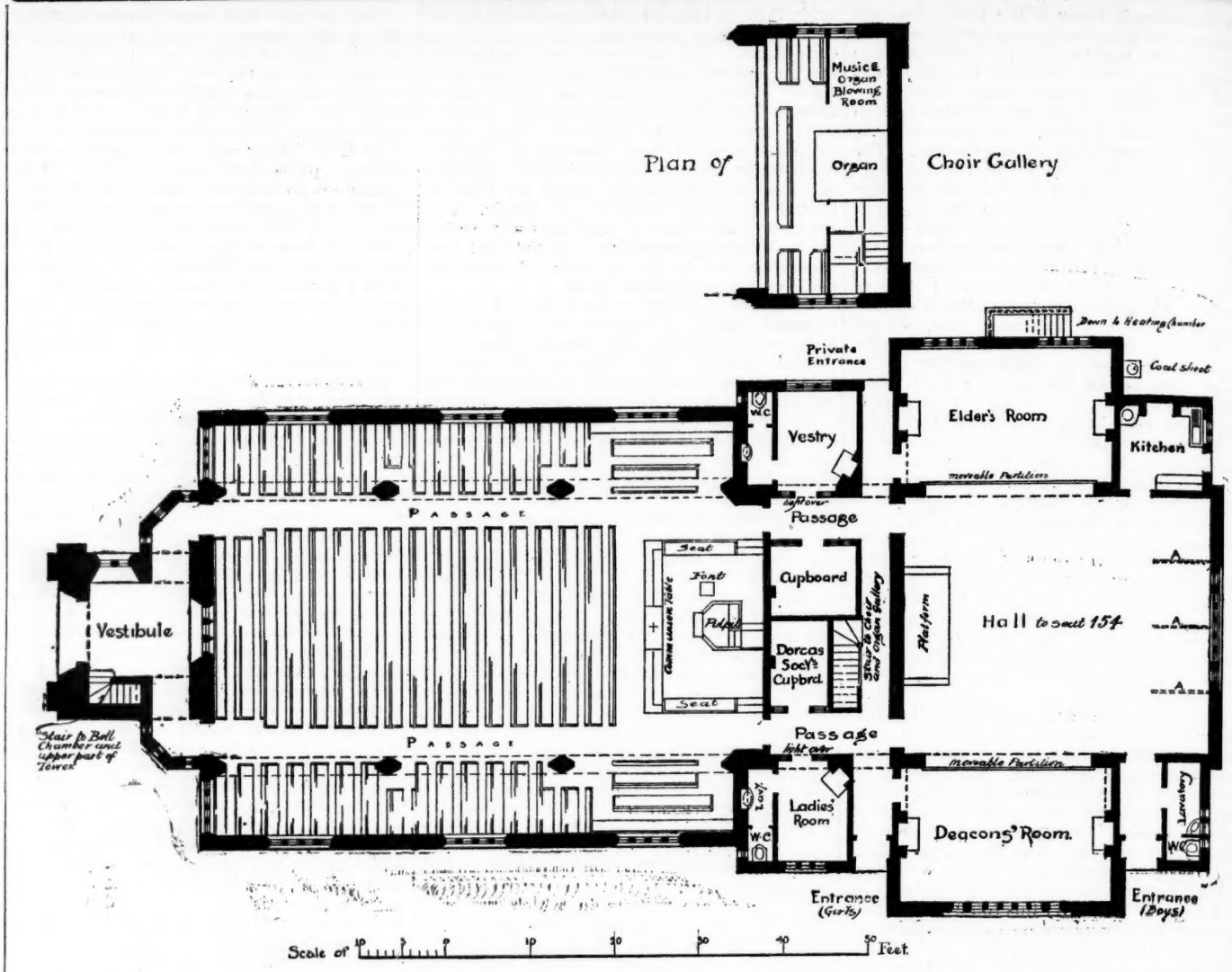
I am not sure that many theatre architects entirely approve every one of our regulations, but some approve certain of them and others probably approve the rest; for, whereas a few years ago not many plans were submitted that would bear examination, there is now a large and increasing number of architects who, so far as their clients will permit them, produce excellent plans and heartily concur in our regulations as a whole. And, as to clients, all the more experienced managers are alive to the risks of their undertakings, and very large sums have been willingly spent by them in the improvement of old buildings. Manchester has taken a good lead in theatre architecture. At the present time, when new theatres are being built in all our London suburbs, and even in small provincial towns, no class of buildings is better understood.

In London the site for a new theatre or music-hall must abut for one-half of the boundary upon public thoroughfares, one of which must be not less than 40 ft. wide. This is exactly one-half of the requirement as to site in most Continental cities, where, as in Manchester, the theatre must be entirely isolated. But our own moderate demand may be relaxed if the building is of small importance or if the design or the surroundings seem to warrant it. We are now actually getting isolated theatres, whereas a few years ago there was not one in London. Not many years ago the owner of a site intended for a theatre would insist on devoting the best portion of his frontage to shops. If the site consisted chiefly of back land the owner would consider it particularly eligible for a theatre. Of such a site I once said to the proposer, "Surely nature intended this for a coal-yard," but he was careful to correct me—it had really been a timber-yard.

Our regulations provide for the separation of dressing-rooms, and such sources of danger as workshops, stores, painting-rooms, property rooms, scene-docks, engine-rooms, and gas meter rooms, and regulate the supply of gas, electric light, lime light, and water. They require a fire-resisting curtain and a high roof with lantern light over the stage. The mischief of windows opening near adjacent property is sometimes imperfectly guarded against by protecting them with hoppers. Recently a fire was caused in a music-hall by an old accumulation of rubbish carried by the wind into one such hopper and fired by burning soot from a neighbouring chimney. Our greatest difficulties arise out of staircases, corridors, and exits.

People who talk of clearing a theatre in two or three minutes fail to realise the suddenness with which smoke and poisonous vapours spread, nor do they appreciate the effect of a panic, which may prevent an audience getting out at all. If a fire breaks out amongst the scenery the whole is alight at once; the vapours make for the upper parts of the auditorium and the people die where they sit. In the great theatre fires it has been estimated that all the victims died from suffocation within five minutes. These are matters which can be reckoned with, hence the provision of fire-proof curtains and high roofs over the stage. But no one can reckon with panic. It needs no fire or other danger. It is a madness to escape from no one knows what. The exits from a public place must allow for panic as well as for fire. Two exits, well lighted by some independent means, must be provided from every part of the building, and as one may be blocked, each must be capable of taking the whole of that part of the audience. They should deliver into different streets. One of these, which will also be an entrance, may be connected with a vestibule that is common to three entrances, and the doorways of this vestibule must be one third wider than the combined widths of these three separate entrances. The least width for an exit is 4 ft. 6 in. in the clear. Too frequently I find that the exits are actually made of this dimension between the brickwork, so that after deducting the thickness of doors and projecting handles, only 3 ft. 4 in. is left. I consider it unfair to expect one to overlook such mistakes in so important a matter.

All exit doors having fastenings must be fitted with bolts yielding to pressure from within. This necessary regulation gives rise to great difficulty. A manager will suspect that persons get access through these exit doors, and also that his servants get out at improper times. In view of the importance of this point, and the impossibility of securing by any system of inspection the opening every night of a door that has locks and bolts, it may be hoped that there



Competition Design for Granard Presbyterian Church, Putney. Plan. [See page 395.

is mechanical ingenuity enough to get over any such objection as I have indicated.

The impossibility of getting the employés about a public place to understand that exit doors and passages are meant to be at all times free and well lighted may be illustrated from experience. The first new theatre that was opened in my time had been rebuilt after a fire, and the proprietor, confident in his arrangements, invited my inspection on the opening night. I found the exits without lights and their doors blocked by the debris thrown out of the building at the last moment. In another case, a few years ago, the architect had provided admirable exits, but insisted on fitting the doors with locks. In the middle of the first performance I found every door locked and the key at the box office, to be used, I was told, if required. In a third case, when everything had been found in order, a final visit an hour before the opening disclosed that handsome fixed grills were being put to every exit door, only to be removed in case of need. We have found exit passages turned into lumber rooms, or obstructed by spare tables, by chairs intended for extra and illegal seats in the gangways, by perambulators, and by bicycles. In one case the exit was the home of a savage dog. The architect must never depend on the care with which his building will be managed, and, in spite of good intentions, the accumulation of spare scenery belonging to pieces that have been taken off or are coming on and the storing of rubbish is always a danger. In important Continental theatres a separate warehouse is provided as near as possible to, but detached from, the building, and there all scenery and properties not actually in use are kept.

And with respect to this last consideration, experience teaches that in cases of sudden danger no audience, no crowd in a house or factory, and indeed no individual, can be trusted to take the obviously reasonable course to prevent accident or to get to a place of safety. Their escape must be ensured for them by the provision of unobstructed exits that are used habitually, that are as short as possible, and that will take a crowd of people as fast as they can get away. Thus the planning of a building in relation to its exits is often of even more importance than its materials, or the question of its site and surroundings, which last is a question often beyond the architect's control. I have advised a theatre architect to begin by laying down on his plan eight staircases and ten or twelve exit doors, and then see whether he had room left for a stage and auditorium. This is more reasonable than planning first these last-named parts, and then using up any spare corners for scanty and inconvenient stairs and passages.

There is no class of public building so risky as the parochial or mission hall or club room which exists for purposes of instruction or social recreation. The licensees of such places are very often too inexperienced to feel any sense of responsibility, and the amateurs who usually manage such matters have no sense of danger. Having consented to preside at an amateur charity performance where the stage had been fitted up by the company, I found the footlights to consist of a row of dwarf candles, each being simply stuck down on a penny piece. During the play one of the canvas wings fell upon these footlights.

Unwarned by the Paris disaster, bazaars are got up regardless of the danger from stalls heaped up with flimsy materials and lighted up by Japanese lanterns, without any special means of fire extinction, and with indifferent means of escape. In a particularly bad case, while the chairman of the committee was arguing against the possibility of accident, a lantern took fire and fell. No more than this is necessary to produce the worst of those accidents which such premises may be said to invite, and the contents of only one stall would have sufficed.

In view of the wide range of this paper and the familiarity of this audience with the details of construction, I have for the most part been content to suggest principles upon which we ought to act. And on account of the importance of these questions in relation to the safety of life, I trust we shall agree that there is a moral duty in every one charged with the erection or care of a building to make it as secure against fire and panic as he can. I confess to some feeling approaching pain when an architect, assuming something like the position of a legal advocate, endeavours to argue that provisions made by law for the safety of life and property mean less than they are commonly supposed to mean, or struggles to get some relaxation of the law which, perhaps unfortunately, the public authority has power to grant. Every relaxation beyond what a prudent man would consider safe is in the nature of a wager that nothing shall happen during the whole time that the building will be in existence, which will call for the particular precaution which, on the responsible advice of the architect, has been injudiciously omitted. It may be that the wager will be won, but the risk is considerable, and always there; and this is a consideration which I desire to impress most strongly upon those who are charged with such responsibilities as I have indicated.

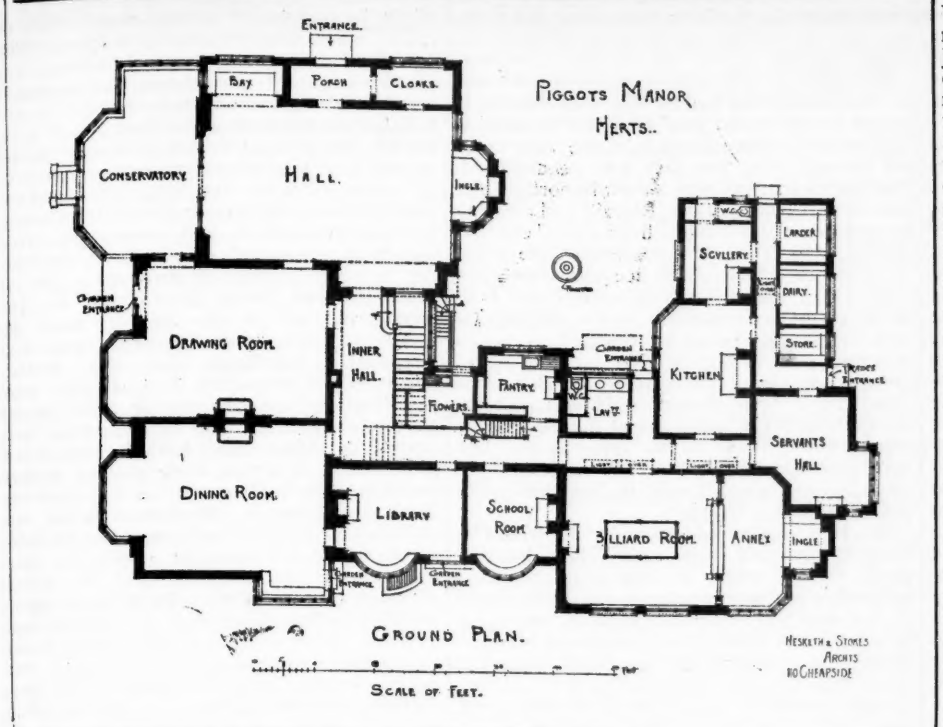
Illustrations.

CHURCH OF THE SACRED HEART, WIMBLEDON.

THE nave of this church was built some twelve years since, after which the work was suspended for a considerable time; it was, however, resumed within the last four years, and already the chancel, ambulator, three apsidal chapels, and the south aisle have been completed, while the north aisle, baptistry, sacristies, &c., are now in course of erection.

The exterior of the whole is faced with knapped flints, with masonry and dressings of Ancaster stone. Internally, the whole of the work is in Beer stone. Up to the present time about 20,000*l.* has been expended, and the portions now in progress will cost another 8,000*l.*

Mr. Frederick A. Walters, of Westminster, is the architect. The view shows the exterior of the chancel with the apsidal chapels.



DESIGN FOR GRANARD PRESBYTERIAN CHURCH, PUTNEY.

THIS design, by Mr. J. C. T. Murray and Mr. C. E. Mallows, received the second premium in a competition for the above-named church.

The materials proposed for the construction were red brick and Doulting stone, with green Westmoreland slating; the floors to be of solid wood blocks, and the internal woodwork stained and varnished.

The whole of the congregation were to be seated in the area, but provision is made for a future end gallery, if necessary. The hall and class-rooms have been specially arranged for the convenience of Sunday-school work, and can be used separately or *en suite* as desired. The cost is estimated to be about 6,500*l*.

The drawing was exhibited at the last Royal Academy.

"PIGGOT'S MANOR," HERTS.

THE house, as shown in accompanying plan and sketches, has just been completed, replacing the old plain stucco Manor House, and is carried out in timber framing and plaster, with red brick dressings where visible, from the designs of Messrs. Hesketh & Stokes.

The whole of the half timber throughout is worked in the solid in English oak, and built into the brickwork.

The house is almost entirely new, only a small portion in the centre of the original Manor House remaining (viz., library, schoolroom, and passage), and has been planned to work in with the old portions, the whole being refaced to harmonise with the new work.

The first floor throughout is constructed in steel and concrete. The joinery and finishings on the ground floor are carried out in wainscot, with enriched plaster ceilings in the billiard and drawing rooms, executed by Messrs. Jackson. The contractors for the general work were Messrs. Webster & Cannon, of Aylesbury, the sanitary work being carried out by Mr. Geo. Jennings, of Lambeth.

The drawing was exhibited at the last Royal Academy.

SUBURBAN HOUSES, BIRMINGHAM.

THESE small houses have been erected with local materials in an inexpensive way to meet the requirements of tenants who wish to have a small comfortable home at a moderate rent. 17 ft. by 13 ft. have been taken as a basis for the size of the sitting-rooms, with five bedrooms over them, and the kitchens, pantries, &c., with a lavatory, baths, and inside water-closet.

Messrs. Bateman & Bateman, of Birmingham, are the architects.

KING'S COLLEGE, LONDON.—The annual dinner of old students of King's College, London, will be held at the Holborn Restaurant, on Monday, June 13. The Bishop of London will take the chair.

THE SURVEYORS' INSTITUTION:

MEETING IN MANCHESTER.

A MEETING of this Institution was held on Wednesday, at Manchester, in the Mayor's Parlour at the Town Hall, the members being welcomed by the Reception Committee, headed by Mr. John Holden, the Provincial Chairman of the District.

After the reception the proceedings were opened with a few remarks from Mr. Robert Vigers, Vice-President, who occupied the Chair in the absence, through ill-health, of the President, Mr. Christopher Oakley. As most of them would be aware, he said, that was the first time that the Institution had held a meeting in the provinces, and Manchester had been chosen because it had more members of the Institution than any other provincial town. It gave him and the Council of the Institution much pleasure to meet their Manchester friends. The Institution had been at work for upwards of thirty years, and as he had been a member from the first, he was able to speak from personal experience of the very great good to the profession that the Institution had been—and not only to the profession, but also to landowners and those interested in landed property. If the members of the Institution held together in the future as they had done in the past, their Institution must continue to be of very great service to them.

The Chairman then called upon Mr. John Holden to read a paper entitled "Manchester —1847 to 1897." The paper contained a great deal of historical and statistical information, a good deal of which however, may be said to have been rather of local than of general interest. We extract however the following passage giving a sketch of the general change of character and aspect of the town since 1847:

"Practically speaking, Manchester and Salford *per se* were contained within a circle of about one mile radius, of which the centre was placed in the centre of the present infirmary building. This circular patch (referring to a plan), which is shown by the thick dotted ine, covered Manchester proper. Of course, roads and streets radiated from it in all directions, giving access to the out districts, and to the surrounding towns, and many districts, although not covered with buildings were projected or laid out, but building operations had not been seriously commenced. In some instances the connexion of the main roads with the town itself was very tortuous, as, for instance, the Bury old road, now called the Cheetham Hill-road, which is now a clear road from Albert-square, along Cross-street, Corporation-street, Ducie Bridge, and Cheetham Hill-road to Bury. At the time I mention the road for coaches and general traffic passed along Cateaton-street, Hanging Ditch, then wound along Todd-street, or Todd-lane, Long Millgate, to Miller's-lane, along which it turned to the left, and then over old Ducie Bridge into York-street, and so on. Deansgate was very narrow, and along the upper part, that is, beyond John Dalton-street, was filled with what may be called hand-to-mouth shops, which catered for the large and poor population at each side, the greatest part of which is now swept away. Piccadilly and London-road was equally inconvenient. Commencing at the Infirmary Pond, or *Daub-holes*, as it was called, not the sweetest place in the world, and continuing past Booth-street, close to which the houses projected at right angles, about one-half way across the present street, then dipping down towards Granby-row. The same applies to other streets in the town. I will, however, describe the town itself as it existed in or about the year first named, or 1847. Many of the streets were narrow and crooked, and the access from one street to another was by no means convenient. It would hardly be possible, within the limits of a paper such as this, to describe the improvements which have been made by the authorities from time to time in seemingly small matters, such as rounding off corners, widening narrow necks, and cutting through from one street to another a few yards only, but which has had the effect of allowing traffic to pass easily from one street to another without going round considerable distances. The streets were paved generally with cobble stones, very imperfectly set and punned with a rammer. Some of the principal streets were paved with large square setts laid in cinders and filled in at the joints with the same material. Of course, the wet passed through and softened the bed, and the mud was something of which the present generation have no idea. The footpaths, where flagged, were very uneven, and in many places were protected by iron posts at the corners of the streets. Buildings were beginning to be replaced with others more in accordance with the times, but great numbers remained as they existed at the end of the last century. Some few of the old warehouses may still be found in Cannon-street, and in the streets right and left. This was at that time one of the principal streets for warehouses, and the old buildings will readily be recognised by their low stories, long windows of comparatively small height, and plain brick fronts. Many of the houses, at that time used for residential purposes, had the large room on the top story with the window extending along the front, at which the old hand looms used to be placed. Similar rooms are still found in the out districts where fustian cutting is carried on. This Cannon-street district has been left behind to a great extent, but is now on the eve of reconstruction. The old half-timbered houses, so beloved by artists and others, were plentiful, but are gradually being removed. The great removal occurred in 1822, when Market-street was widened. Long Millgate was full of them, also about Deansgate and Red Bank, and some few specimens existed at Smithy door, notably the Vintners' Arms, and the building afterwards called Coryton's Bank; these were removed about 1873, for the widening of Deansgate. Several also are in Shudehill and Withy Grove, in particular the Seven Stars public house, said to be one of the oldest licensed houses in the country, and the Rover's Return public house. Also houses in Greengate, Salford; and the Wellington Inn, Market Place, and Old Shambles, Manchester, both licensed houses. A number of these houses were demolished a few years since at a place called Gibraltar, near Scotland Bridge, to make way for extensions of the Lancashire and Yorkshire Railway."

Mr. J. Cross, in proposing a vote of thanks, referring at some length to the rateable value of Manchester and Salford, said that the figures given by the lecturer related really to the parish of Manchester, which was comparatively a small portion of the present city.

Col. Bridgford, in seconding the vote of thanks, said that the prices given by Mr. Holden were rather under the prices at the present time.

The vote of thanks having been carried and Mr. Holden having briefly replied,

Mr. C. P. Hall read a paper entitled "A Consideration of some of the Present-day Difficulties met with in a Land Agent's Practice." In the course of his remarks he referred to the question of rent reduction, the supply of labour and allotments. In regard to new buildings and holdings, he said that a great deal of consideration was necessary before yielding to the requests of tenants for

them. A tenant invariably asked for the provision of certain holdings to suit his own particular fancies, and frequently, after the expenditure of considerable sums of money, the tenancy proved short and the successor adopted quite different methods, for which the new buildings were worse than useless. Unless, therefore, there was a real necessity for such buildings for the proper management of the holding, an owner would be well advised in declining to incur the outlay. Further, it was often desirable to withhold consent to the tenant doing the work himself, unless in the case of temporary structures, which he should agree to remove on the expiration of the tenancy. The dual interest in the holding created by the erection of buildings by the tenant was wrong in principle, and the owner was probably compelled sooner or later, by the termination of the tenancy, to acquire jerry-built premises, costly to repair and of small credit to the landlord when he owned them. It was different with repairs. When a holding was equipped with substantial and convenient buildings every effort should be made to keep them up, even if the present altered conditions of agriculture (such as the conversion of arable to pasture) should render them unnecessary in their present form. Estate repairs was a heavy item, but it was wiser to keep up buildings on which large capital had already been sunk than, by neglect, to allow them to become ruinous, when no one could tell how soon they might be required again. The most satisfactory method of carrying out repairs on a large estate was by the employment of workmen direct, provided there was sufficient supervision. It was cheaper, and the work was more thoroughly done than by the employment of a contractor. In the case of entirely new work of any magnitude, he thought the contract system preferable. The author then dealt with the repair of fences, the game question, and trespass.

On the motion of Mr. Bidwell, seconded by Mr. J. W. Fair, a vote of thanks was accorded to the lecturer.

After a short adjournment for luncheon, a paper was read by Mr. Thomas Blashill, entitled "Lessons from Fire and Panic," which, with the exception of one or two introductory sentences, we print in full on another page.

In the discussion which followed

Mr. Richards, M.P., in moving a vote of thanks to Mr. Blashill, said there was an urgent necessity for non-inflammable floors. In the fire in Tabernacle-street nearly all the new buildings, which were provided with what were called fire-proof floors, collapsed in a very short time. In regard to the requirements of the London County Council, he had nothing but praise for the determined efforts they had made to prevent places of amusement becoming places of sudden death. London had had many authorities, and he was afraid it was not perfect yet. Mr. Blashill, one of the most conscientious officers in London, had a very difficult task to perform. Those who remembered the discussion in committee on the London Building Act and the evidence which was given, were made conscious of the difficulty of enforcing modern views as to narrow streets, crowded areas, &c. He would have liked to have heard a few more definite remarks from Mr. Blashill as to the exits from churches and chapels. He (the speaker) knew of many such buildings, where, in the event of a panic, the results would be most disastrous. He thought it would be advisable for the County Council to occasionally inspect these buildings, and also to look after the way chairs were placed in places of worship.

Mr. H. H. Collins seconded the vote of thanks, and referred to the changing character of the County Council requirements. Even in regard to theatres there was no finality as to the requirements, and the Council put a manager of a theatre to a great deal of expense, and, shortly after, the expenditure was found to be in a large measure useless, and something more was demanded. The paper contained so much that needed reflection, and so many points that might be very usefully discussed at length that he suggested its full discussion be adjourned until the Institution next met in London.

Mr. Holden said that fire arrangements should be made as simple as possible, and in such a way as not to be interfered with or neglected. He thought a continuous balcony a very good provision for escape from fire in houses. Iron was one of the worst materials to use in buildings where there were fire risks, for, as joists, it bent and twisted, whereas oak beams did not.

Mr. Hartley, of Liverpool, supported the vote of thanks, and said that he had often found that where provision had been made for all kinds of appliances for the extinction of fire they could not be used at the time they were needed most. The question of exit was a most important one, and he was glad that Mr. Blashill had referred to exits in connexion with churches and chapels, as well as in places of amusement. He knew of a church which could accommodate 1,200 people were there were two small doors, both of which opened inwards. It was very necessary that people should be protected in places of worship as well as in other buildings. He quite agreed that decorations in churches were very often a great danger. He was quite in accord with Mr. Blashill as to balconies, but he would restrict them to the upper floors—that was, floors which could not be reached by a short ladder, or easily from the ground—so as not to encourage burglars.

Mr. H. S. Payne said that dry rot would be likely to result if floors were made too air proof. One merit of the jerry builder's methods was that dry rot was not discoverable in the buildings they erected. It might be information to some of his hearers if he mentioned that on board the American liners the crew regularly took part in fire drill, and he thought that the County Council should require a fire drill amongst assistants in theatres.

Mr. Howard Martin said that he could give an instance of the effect of fire upon iron construction in floors. In the Cripplegate fire nine warehouses in a row of ten were new, with fireproof floors, and the other was an old building, with wood floors. The iron in the fireproof buildings buckled and wrecked the walls of the buildings, whereas in the case of the old building the walls stood perfectly well.

The vote of thanks to Mr. Blashill having been unanimously agreed to, the further discussion of the paper was adjourned.

A vote of thanks to the Chairman was proposed by Mr. Holden, and seconded by Mr. Wainwright, and carried, and the meeting separated.

A paper entitled "Notes on the Construction of Town Buildings," by Mr. Howard Chatfeild Clarke, was taken as read. We shall print it next week, together with a report of the dinner which took place in the evening at the Grand Hotel.

On Thursday the following visits were made:—To the City of Chester and Eaton Hall; the Manchester Ship Canal; the London and North-Western Railway works at Crewe; and Egerton Cotton Mills, and the Corporation Sewage Farm.

ARCHITECTURAL SOCIETIES.

EDINBURGH ARCHITECTURAL ASSOCIATION. At a meeting of the Edinburgh Architectural Association in the Royal Institution on the 6th inst., Mr. Thomas Ross, the President, in the chair, Bailie Pollard, Convenor of the Town Council's Public Health Committee, gave an address on "Fever Hospital Structure, with special reference to the new City Hospital at Colinton Mains." Having given a brief sketch of the history of the development of isolation hospitals, the lecturer said that it was only in recent years that local authorities throughout Great Britain had been aroused by public opinion and legislation, so that infectious hospitals were now becoming general all over the country. He proceeded to show that the prime consideration for the architect of a fever hospital must be to make his structure an instrument of healing. External appearance was not to be despised, but the internal arrangements must receive closest study and most minute care. With reference to situation, he remarked that well-regulated fever hospitals might exist even in populous centres without detriment to the community. When the choice of a site was in view, many reasons showed that the hospital was best at a distance from other dwellings, not so much for fear of spreading disease as for the sake of the institution itself. The size was relative to the population of the community to be served. Differing from Dr. Thorne, of the Local Government Board, who suggested hospital provision for one per 1,000 of the inhabitants, the lecturer advocated larger hospital accommodation, and, upon experience of Edinburgh, was prepared to maintain that provision should be made for one in every 600. Materials of the structure might be pasteboard, canvas, wood, brick, or stone. Stone was preferred in Scotland. The laying out and arrangement of buildings was dwelt upon, and it was shown how needful it was that the different diseases should be classified, and cross infection guarded against; while the different parts of the whole structure should be so placed as to secure greatest convenience of access between the sick rooms and the administrative, culinary, and other departments. Drainage, ventilation, and heating were then described as elements of essential importance, the requisite amount of floor space and air space per bed being also alluded to. The laying out of wards and of ward accessories, baths, and lavatories was next discussed. Dwellings for the doctors, nurses, ward attendants, and servants were described, and the most suitable arrangements for kitchen, laundry, and other services were dealt with. After setting forth the main objects to be sought in a completely efficient modern hospital, Bailie Pollard proceeded to show how these were likely to be obtained in the new city hospital at Colinton Mains. He exhibited by means of the limelight a series of views from the plans prepared by Mr. Robert Morham, City Architect. He directed special attention to the situation of the hospital, with its southern exposure and uninterrupted sunlight, alike during winter and summer. Particular mention was also made of the large provision of sun rooms for patients during convalescence. In conclusion, he observed that, only second to its use as a healing institution, the hospital should afford a training school for nurses, and an important place of medical instruction.

BRISTOL SOCIETY OF ARCHITECTS.—The annual general meeting of this Society was held at the Fine Arts Academy, Queen's-road, on Monday last, Mr. F. W. Wills in the chair. The President, Mr. W. L. Bernard, F.R.I.B.A., and Vice-Presidents, Messrs. Joseph Wood and W. V. Gough, were re-elected, and a vote of thanks was accorded to the retiring Hon. Sec., Mr. W. S. Skinner. Mr. H. Dare Bryan was elected Hon. Sec. for the ensuing session.

NORTHERN ARCHITECTURAL ASSOCIATION.—The annual report of this Association records a continued increase in numbers, the Association now including 145 members. The report records, among other incidents of the past session, the presentation by Mr. Glover, the Vice-President, of an insignia or badge to be worn by the President for the time being, which was designed by Mr. W. S. Hicks, and executed by the Goldsmith's Company.

LIVERPOOL ARCHITECTURAL SOCIETY.—A dinner was held on Monday, the 18th inst., in the Walker Art Gallery, to commemorate the fiftieth anniversary of the founding of the Society. The President, Mr. W. E. Willink, was in the chair, and among the invited guests were Mr. E. W. Mountford, representing the Institute of Architects; Mr. Hampden W. Pratt, President of the Architectural Association; Mr. John Ely, President of the Manchester Architectural Society; Mr. George Corson, President of the Leeds Society; and Mr. C. E. Bateman, President of the Birmingham Society. After the toast of "The Queen," Professor Simpson proposed "The Royal Institute of British Architects and the Architectural Association." He said that a great deal of good work was done by both societies; that the Institute by the prizes they gave annually assisted greatly many young architects, and that among the list of the prize winners of fifteen or twenty years ago could be seen the names of many of the best architects of the present day. But the great friend of the student, he said, was the Association. It was the pioneer of architectural education in England, and for many years did most excellent work unaided. Mr. Mountford, in reply, said that the Royal Institute did deserve well from the architects of the country. They got through an enormous amount of work on behalf of the profession at large, and by which it benefited. Whatever might be thought of examinations, there could be no doubt whatever that examinations had been productive of good results. Men who had been "relegated" tried again, and did very much better. Liverpool was to be congratulated upon the existence of its School of Architecture and Applied Arts, and upon having the management of that school in the hands of such men as Professor Simpson, Mr. Allen, and Mr. Anning Bell. Mr. Hampden Pratt, responding for the Architectural Association, said it might be stated

with perfect truth that the architects of the present and the architects of the future were for the greater part those who had passed, or would pass, through the ranks of the Architectural Association. At the present time, when they were being, as it were, assailed by boards of technical education, which were to some extent their competitors and rivals, they endeavoured, as an Association, to hold their own, and they did so on the ground that however competent these technical boards and classes and institutes might be, they could not and never would take the position that the Architectural Association had been able to and still could take in regard to the profession. Mr. Hartley proposed the toast of "The Allied Societies." He said that the allied societies might have benefited by their connexion with the Institute, but the Institute had no doubt been strengthened by having connected with it the allied societies. In view of this connexion they might look forward to better days, when advanced education would be better understood, and when some systematic action would be taken by provincial societies, such as they had taken in Liverpool, that would benefit the coming generation of architects. Mr. John Ely acknowledged the toast, which, he said, embraced fifteen societies, with a membership of something like 1,000. He congratulated the Liverpool Society upon the attainment of the fiftieth year of its existence. Mr. T. D. Barry gave "The Liverpool Architectural Society." He said he was the only living instance of the first committee of the society. He presided over the "silver wedding," and he was now privileged to propose the toast of its fiftieth anniversary. The Chairman, in replying, expressed their thanks to those who had permitted the Society to hold its jubilee dinner in that gallery, where they were able to appreciate the great strides made in recent years towards the attainment of art and applied art which they so much desired. The succeeding toasts were those of "The Guests" and "The President."

COMPETITIONS.

PENRITH COTTAGE HOSPITAL.—A competition has just been decided for the erection of a cottage hospital at Penrith. Messrs. G. Watson & Son, Penrith; Mr. G. D. Oliver, Carlisle; and Mr. Martindale, Carlisle, were invited to compete, and the plans sent in by these gentlemen were considered at a meeting recently, and those marked "Fitness" were selected. These plans were found to be by Messrs. G. Watson & Son, and they were appointed architects to carry out the work.

SCHOOLS, WEST CARRON, STIRLING.—Some time ago Larbert Parish School Board agreed to take in six competitive plans for the new school proposed to be erected at West Carron. It was arranged to ask two plans from Falkirk architects, two from architects in Stirling, and two from Glasgow architects, and to send the plans to an Edinburgh architect for a report and recommendation as to which he thought should be adopted. A meeting of the Board has been held to consider the report, when it was found that the Edinburgh architect gave the opinion that the plans of Messrs. M'Luckie & Walker, Stirling, stood first in order of merit; those of Mr. Jas. Strang, Falkirk, second; while the plans of Mr. Simpson, architect, Stirling, ranked third in the list. It was agreed to adopt the plans of Messrs. M'Luckie & Walker. The school to be built is to accommodate 650 children, at a cost of 6,700*l*.—*Falkirk Herald.*

ENGINEERING SOCIETIES.

THE CIVIL AND MECHANICAL ENGINEERS SOCIETY.—A meeting of the above society was held at the Hotel Victoria, Charing Cross, on Thursday, April 14, 1898, Mr. B. B. Dodley, vice-President, in the chair. A paper was read on "Pipes and Pipe Laying," by Mr. Alfred Hanssen. The author first drew attention to the largeness of the subject, but that he would beg to limit the paper to cast-iron and stoneware pipes, and drew attention that, to a great extent, the health of the town and country depended on the use of proper pipes, several specimens of pipes being exhibited,—amongst others, a very fine specimen of a cast-iron pipe, that had been made over 100 years. One of the most important points in pipe-laying was the proper jointing of two pipes, several methods being discussed, and also the various methods used in different countries. The next important point was the depth of the pipes to protect them from the frost, and also the crushing weight by the passing of heavy carts over the mains and sewers.

THE LONDON BUILDING ACT, 1894.

TRIBUNAL OF APPEAL CASE.

THE Tribunal of Appeal under the London Building Act, 1894, sat at the Arbitration Room of the Surveyors' Institution on Monday, to hear an appeal by the Lion Brewery Company, Limited (by their solicitors, Messrs. J. White & Leonard), against the decision of the London County Council contained in a resolution passed by that body on February 8, sanctioning certain deviations from the plan certified by the District Surveyor under Section 43 of the Act, subject to certain conditions in the matter of the proposed re-building of the "Nags' Head" public-house, No. 31, Foubert's-place, Regent-street, under the provisions of Section 43 of the Act. The members of the Tribunal sitting were Mr. Arthur Cates, chairman, Mr. J. W. Penfold, and Mr. A. A. Hudson. Mr. A. F. Wootten, barrister, appeared for the appellants, and Mr. Seager Berry for the County Council.

Mr. Wootten, in opening the case for the appellants, said the property in question was situate upon a street formed or laid out before the passing of the Act. The sub-Section 2 of Section 43 of the London Building Act, 1894, under which the appeal was made, read as follows:—"If a person erecting the intended domestic building shall desire to deviate in any respect from the plan or plans certified by the district surveyor, it shall be lawful for him to apply to the Council, who shall sanction such deviations on such conditions as they may think fit, provided that such conditions shall not in any case be more onerous than the conditions prescribed for domestic buildings erected after the commencement of this Act, abutting on a street formed or laid out before that date." This instruction, said counsel, was decidedly definite, viz.: that the County Council *shall* sanction such deviation. On January 10, 1898, application was duly made for permission to deviate from the old plan. On February 28, his clients' architects (Messrs. Goodwin & Sons) received intimation from the County Council's Architect (Mr. T. Blashill) that sanction had been given subject to the following conditions:—"That the provisions of Section 41 of the Act with respect to the open space and height of the new building at the rear be complied with in the rebuilding; and that the said new building be otherwise made in entire conformity with the letter of application." The appellants on receipt of this letter consulted Messrs. White & Leonard, who wrote the Council's Architect to the effect that they thought there must be some misapprehension as to the facts, as no more land was proposed to be occupied by the new building than was occupied by the previously existing building; in fact, the occupied land would be slightly less, and the air space equal to the old conditions. Replying to this, the superintending architect wrote that the discretionary power conferred on the Council by Section 43 to sanction deviations was limited to cases in which no more land was to be occupied by the new than was occupied by the previously existing building. The letter continued, that as on rebuilding No. 29, Foubert's-place it was proposed to leave an area in the rear of less extent than that which formerly existed, the Council could not under the provisions of Section 43 entertain the application for permission to do so. Proceeding, Mr. Wootten contended that the conditions of sanction made by the Council were bad in law. First of all because they amounted in fact to a refusal to sanction the deviations, though the Act was imperative and said the Council "shall" sanction. His second point in law was that the conditions were more onerous than permitted by the Act. His third point was that they were uncertain and indefinite, and, therefore, unreasonable, and not made with proper exercise of discretion. For the purposes of his argument, he assumed that the provisions the County Council wished to impose were contained in Part II. of Section 41 of the Act. The substance of those provisions was that at a level of 16 ft. from the pavement there must be an open space extending throughout the width of the building to a depth of at least 10 ft., and that the diagonal line must start from that level. On looking at the sectional plan, it would be seen that it was impossible, if the section was complied with, to carry out the deviation which the Council had sanctioned, because the building would have to be set back to a line which utterly destroyed the value of the sanction. It was not necessary for him to demonstrate in fact that the conditions made the sanction nugatory, because the Council, by their architect's letter of March 10, admitted that such was their intention, and that the only way in which they could deal with plans of which they disapproved was to make them nugatory by means of conditions. He contended that the conditions imposed by the Council in this case could not really apply, as the building was situate on a street formed or laid out before the Act was passed. He contended that if in such a case the Council prescribed the conditions of Section 41, sub-Section 2 then they made their sanction no sanction at all, because the owner of the building could have built in compliance with that Section without going to the Council at all. As to his second point in law he assumed that they would have to comply with conditions which were more onerous than permitted by the Act. As to his last point, that of the uncertainty and indefiniteness of the conditions, he said his clients first of all got the Council's sanction to the plans. Then they got the provisions of Section 41 to be complied with. Taking those facts together the one part was utterly inconsistent with the other, for they could not both comply with the plans and also with Section 41. It was quite clear to him that the conditions in question had been hurled arbitrarily at his clients, and without due consideration of the merits of the case by the Council. He asked the Tribunal in its discretion to relieve his clients from all or part of the conditions the Council had laid down.

Mr. Leonard William Goodwin, architect of the building in question, gave evidence in support of counsel's statement, and said that the total increase of air space which would be obtained by the deviations was 254 cubic feet 6 in.

By the Chairman: The proposed first floor would occupy a certain amount of air space which was at present open. The area of air space provided by the old plans was 123 square feet, but that which would be provided by the proposed deviations would be 61 ft.

The Chairman pointed out that by the Act of 1855 an air space of 100 ft. had to be provided, and by the Amendment Act of 1882 200 ft. had to be provided, so that the appellants were asking for permission to provide less air space than was even allowed by the Act of 1882.

Mr. Seager Berry, replying to the arguments of Mr. Wootten, said he thought they could be met by one simple explanation. It appeared that the application for deviation was not intended to apply to a deviation as to height, but the County Council had been labouring under the impression that it did. What the Council said in effect by their consent was that they objected to the covering up of existing air space. They had no objection to an extra story to the building, but they declined to allow existing air space to be encroached upon. The appellants were really asking to be allowed to do a thing which was not permitted by law. Their only reason seemed to be that they wanted to put up a better public-house and do a better trade. That was a very natural wish, but they should not be allowed to do so at the expense of their neighbours. He therefore asked the Tribunal to dismiss the appeal.

After a consultation between the parties, with the guidance of the Tribunal, Mr. Wootten suggested the following as a compromise upon which the Tribunal might base their decision:—To remove altogether the building on the east side above the first-floor level, to provide there an open area of not less than 130 ft. superficial, and on the remaining space in the rear of main building to erect a building not exceeding in height to the eaves of the roof thereof 24 ft. above the level of the pavement, and not exceeding the diagonal line of 63½ degrees.

Mr. Berry said he should be prepared to accept this proposal.

The Chairman then intimated that the Tribunal would allow the appeal, and decide that re-building might proceed subject to the conditions agreed to.

Mr. Wootten asked for the costs of the appeal.

Mr. Berry objected.

After further argument, the Tribunal agreed to consider the question.

BOOKS RECEIVED.

THE BOOK OF GLASGOW CATHEDRAL. Edited by George Eyre-Todd. (Glasgow: Morrison Bros.)

THE CATHEDRAL CHURCH OF HEREFORD. By A. Hugh Fisher. (Geo. Bell & Sons.)

Correspondence.

To the Editor of THE BUILDER.

THE "WARRANT" DESIGN FOR ST. PAUL'S.

SIR,—In your criticism on my History of Renaissance Architecture (the *Builder*, April 16, 1898) you say: "Mr. Blomfield endeavours to suggest that Wren could never have seriously intended this" (the warrant design for St. Paul's "with the gigantic needle on the top of the cupola") "that it was a design made to catch the vulgar eye, with the intention of eluding it afterwards." May I point out that on pages 167-68 of my book I have expressly said that Wren "probably designed it in all good faith in the first instance, and that he did so may be taken as further evidence that the faults and inferior technique of Wren's earlier work were the result of inadequate training."

REGINALD BLOMFIELD.

*** On referring to the book, we find that we did inadvertently attribute to Mr. Blomfield an opinion which he had in fact mentioned as that of another writer.—ED.

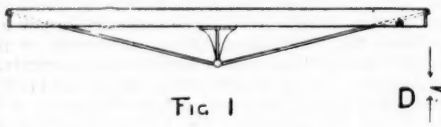


Fig 1

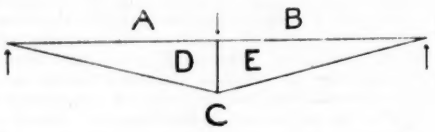


Fig 2

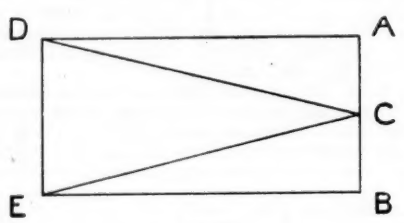


Fig 3

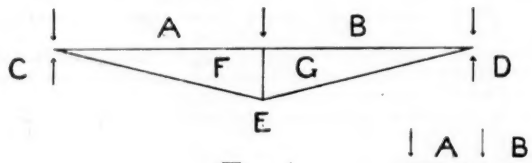


Fig 4

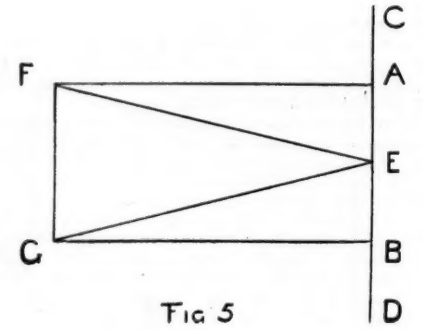


Fig 5

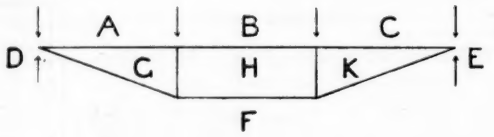


Fig 6

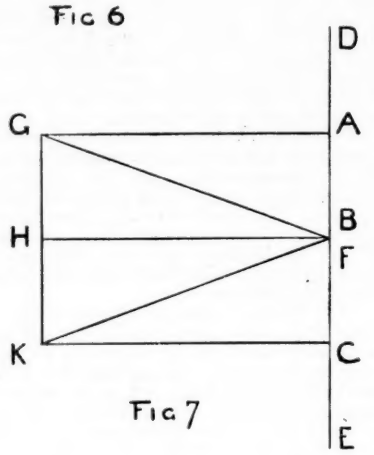


Fig 7

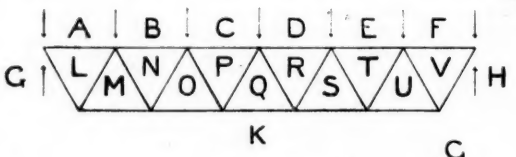


Fig 8

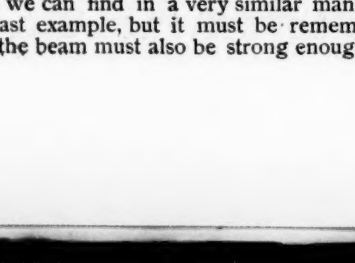


Fig 9

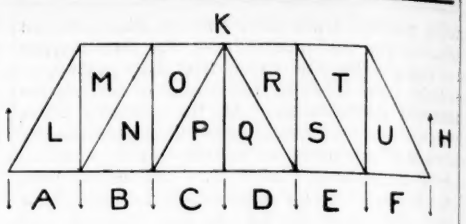


Fig 10

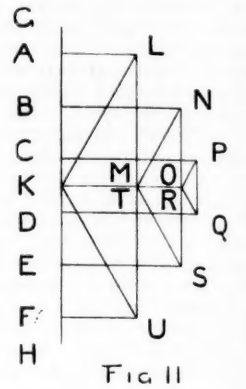


Fig 11

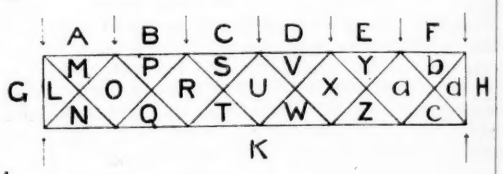


Fig 12

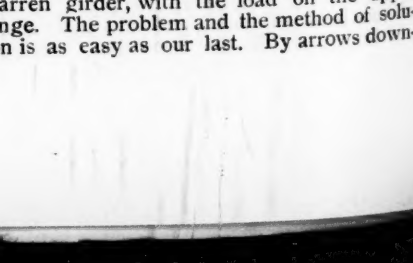


Fig 13

"BEAUTY IN ENGINEERING DESIGN."

SIR,—Referring to the note in your issue of April 9, page 344, I think you will see from the short report published that I thoroughly disapproved of the introduction of added architectural embellishments in engineering design.

I am not prepared to suggest the motive that has prompted engineers to hide, by external ornament, often of a tawdry nature, the work they have reason to be proud of as examples of structural skill, but I presume that they pandered to what they believed public taste required; at the same time, this want of appreciation of the truly beautiful has not been confined to engineers, and architects have, in my opinion, not only been equally at fault, but have used the addition of architectural features to cover up defects in construction.

E. FUHRMANN CLARKE.

*** Mr. Clarke seems to have missed the real point of our Note. He said that engineering works were not to be improved by the addition of architectural ornament, and evidently implied that architects believed that they were. What we pointed out was that architects—those who were worth the name—would be the first to disclaim any such view.—ED.

ANCIENT SOUTHAMPTON.—A collection of drawings illustrative of ancient Southampton which has been made by Mr. William Burrough Hill, a surveyor who is a native of the town, is on view in the small hall, Philharmonic, Above Bar, Southampton. The collection is open free, and is exhibited solely with the view of interesting the public in these records of the history of the town, which include, it is said, many representations of old streets and houses that have now disappeared. We have not been able to visit the exhibition, but we entirely sympathise with its object and with the spirit in which it appears to be carried out.

The Student's Column.

THE CALCULATION OF STRENGTH OF MATERIALS AND RESISTANCES.—XVI.

THE method of finding the amount of the stresses in a truss by means of the reciprocal diagram of forces can be applied as readily to any form of girder which is made up of trusses as to the examples of roofs which we have given.

Let us first take as an example a simple form of wood girder trussed with a cast-iron strut under the middle and a continuous wrought-iron tie-rod passing from end to end of the girder under the strut, as shown in fig. 1. We will suppose that the load on the girder is a single one concentrated immediately over the strut, then fig. 2 is our frame diagram with the known forces, which are the load and the two reactions of the supports, marked as before by arrows. Our spaces between these three forces we letter A, B, and C, and those between the parts of the truss, D and E. In fig. 3 we have our reciprocal diagram, in which we draw A B to represent the load, and A C and C B to scale the reactions, then C D and C E are drawn parallel to the lines of the tie-rod, and D E parallel to the vertical line of the strut. The lines in the reciprocal diagram represent to scale, therefore the stresses in the parts of the trussed beam to which they are parallel. Next let us suppose that the beam has a uniformly distributed load. The stresses in the truss we can find in a very similar manner to our last example, but it must be remembered that the beam must also be strong enough as a beam to carry its distributed load over the spans between the points of support which are the strut and the supports, whether walls or otherwise, at the ends of the beam. Our reciprocal diagram gives us the stresses in the truss. In fig. 4 we have our frame diagram with, as usual, arrows showing the direction of the known forces, and the letters A, B, C, D, E, F, G for our spaces. Then in fig. 5, our reciprocal diagram, we draw C A, A B, B D to represent our loads, and C E, E D our reactions. Then E F, A F, E G, B G, and F G we draw parallel to the members of the truss, and consequently representing them in magnitude.

In fig. 6 we give the frame diagram, and in fig. 7 the reciprocal diagram of a timber girder similar to that we have been considering as shown in fig. 1, but with two struts instead of one. The method of procedure is the same as before. Having drawn our frame diagram and lettered the spaces, we draw in the reciprocal diagram, D A, A B, B C, C E, representing to scale the loads on the several points, and D F, F E (F happens to coincide with B) for the reactions. Then F G, A G, F K, C K, G H, B H, K H, parallel to the members of the truss hence representing in magnitude to scale the stresses in those members.

We will now extend our investigations to some of the most commonly used forms of iron and steel open web or trussed girders. Of these we will take those known as the Warren, the Whipple-Murphy, and the lattice girders as examples.

In fig. 8 we have the frame diagram of a Warren girder, with the load on the upper flange. The problem and the method of solution is as easy as our last. By arrows down-

ward we indicate the direction of the loads at the various points, by arrows upward the reactions of the supports. We letter the spaces between the directions of the forces and external to the truss, A, B, C, D, E, F, G, H, K, and those between the parts of the truss L, M, N, O, P, Q, R, S, T, U, V. Then in fig. 9 we have our reciprocal diagram G A, A B, B C, C D, D E, E F, F H representing to scale the loads, and G K, H K the reactions. Drawing K L, A L, L M, K M, M N, B N, N O, K O, O P, C P, P Q, K Q, Q R, D R, R S, K S, S T, E T, T U, K U, U V, F V, V K parallel to the members of the truss, we have these lines also representing to scale the magnitude of the stresses in the parts of the truss to which they are respectively parallel.

In fig. 10 is shown the frame diagram of a Whipple-Murphy girder with the load on the lower flange. As in the last example, the arrows downward indicate the direction of the loads, and those upward the reactions. The external spaces are lettered A, B, C, D, E, F, G, H, K, and the internal spaces L, M, N, O, P, Q, R, S, T, U. Then in the reciprocal diagram, fig. 11, we draw, representing the known forces to scale, G A, A B, B C, C D, D E, E F, F H, G K, H K, and parallel to the members of the truss we draw the lines A L, K L, L M, K M, M N, B N, N O, K O, O P, C P, P Q, D Q, Q R, K R, R S, E S, S T, K T, T U, F U, U K. These, therefore, give us to scale the magnitude of the stresses in the members of the truss.

In fig. 12 the frame diagram of a lattice girder is given, the load being on the upper flange, and in fig. 13 the reciprocal diagram. The only point which is likely to puzzle the student at starting is the position of the points L and *d* in the reciprocal diagram. The diagonals being, as usual, in lattice girders, drawn at the angle of 45°, G L will be half G K, and H d half H K.

It will be noticed that in working out the reciprocal diagram, R and S come at the same point, W, U, and T at the same point, and X and V at the same point. This indicates that the members of the truss R S, T U, U W, V X, have no stress brought upon them by the loading of the truss. They serve, therefore, only to stiffen the members to which they are rivetted against the tendency to bend laterally.

It would be instructive for the student to work out examples of the Warren, Whipple-Murphy, and lattice girders, with the loads differently applied to the examples we have given, noting, as in the case of our lattice girder, that when lines are reduced to points in the reciprocal diagram, the members they represent are free from stress.

CHAPTER XVII.

IN dealing with the stresses on the parts of a roof truss by means of a reciprocal diagram, we have in the examples given assumed that the load in each case was a vertical one; and this is true as far as the load on the roof itself is concerned, and it is often so taken in practice, sufficient weight being allowed for the probable load of snow and effect of wind. For more exact calculations, however, and to calculate precisely the effect which would be produced on a roof by the wind pressure, it is necessary to consider the angle at which this meets the inclination of the roof, and to calculate the stresses as due to forces which may be resultant from the wind pressure and the weight of the roof. Let us suppose that in fig. 1 we have an ordinary king post truss. Here the weight acts vertically downwards at the points A, B, C, D, E, whilst the wind pressure acts upon the roof at various angles, of which it is difficult to say anything more precisely than that it will probably not, save in very exceptional circumstances, be vertically downwards. If we assume that the wind is acting in a horizontal direction, with a force of, say, 50 lbs. to the square foot, we have a formula for calculating the wind pressure normal—that is, perpendicular to the roof plane, which is this :—

Normal pressure = P (sin. α) 1·84 cos α — 1, where P is pressure of wind on a vertical surface of one square foot (say 50 lbs.), and α is the angle of inclination of the roof.

This works out to about—

25 lbs. per square foot for one-fifth pitch.
30 " " " one-fourth pitch.
33 " " " 30° slope.
36 " " " one-third pitch.
43 " " " 45° slope.

We therefore have to find the resultant due to this normal wind pressure and the weight, which can be obtained by the parallelogram of forces as indicated by the dotted lines on our diagram. The diagonal of the parallelogram represents in magnitude and direction the resultant of the forces acting upon the roof at the point D.

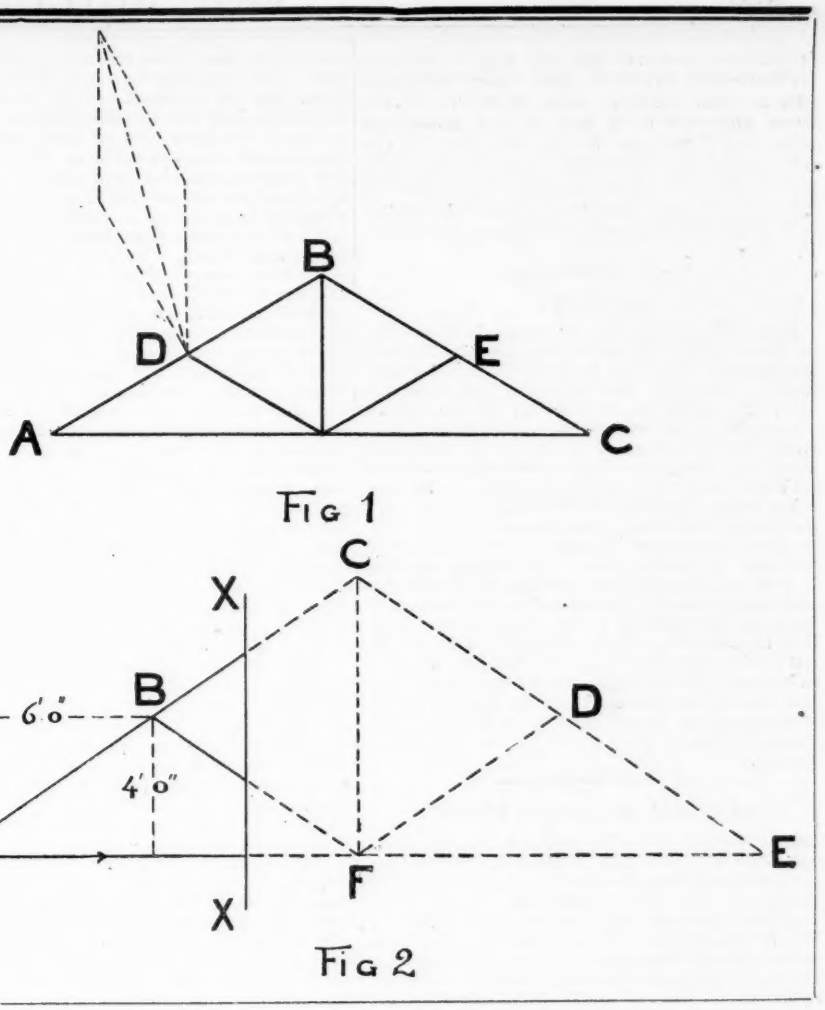


FIG 1

FIG 2

There is another method which may be employed for finding the stresses in parts of a roof or other trusses, the "method of sections" which is occasionally useful when the stress in one or a few members of the truss is required rather than those in the whole, and this method is rather quicker for this limited purpose than the reciprocal diagram. It is also useful as a check on the accuracy of the results found by the reciprocal diagram. These should, of course, be perfectly correct, but their accuracy depends upon precision in drawing, and is therefore not always quite perfect.

The method of sections may be thus explained :—The truss or other construction of which the stresses are to be investigated is assumed to be divided into two parts by an imaginary section line, which need not necessarily be a straight one, and which should preferably cut through three of the bars or members of the truss.

The next point it is most important for the student to understand, as upon it depends the rationale of the "method of sections."

In a properly designed and constructed truss the members are under stress and the truss is kept in equilibrium by the sufficient resistance to the stress offered by the parts of the truss. If, therefore, the truss were actually cut in the manner of the assumed section, each or either of the parts would still be kept in equilibrium if to the severed members were applied forces equal to the stresses they experience in the complete truss.

This, then, is the basis of the "method of sections," and by taking moments about a suitable point, we can find the stress in any one of the severed bars that we please.

Let us suppose that in a king post truss we desire to find the stress in the tie beam. In fig. 2 we have the frame diagram of our truss with an imaginary section line X X. Each part of the truss would still be in equilibrium if forces equal to the stresses were applied to the severed bars. Let us deal with the left-hand part of the truss and take moments about the point B, at which two of our three severed members meet, remembering that forces tending to produce revolution about B in the direction of the hands of the clock are positive that those tending to produce revolution in the opposite direction are negative, and that as the forces are in equilibrium the sum of the moments is zero. The forces with which we have to deal are the vertical pressure downwards of the part of the load on the roof acting at A, the vertical reaction upwards of the support at the same point and the horizontal tension in the tie. These we have indicated by arrows. The downward pressure at A let us call W, the vertical reaction R, and the tension T; the perpendicular distance from B to the direction of W and R we will call l and that from B to the tie beam m. Then we shall have for the sum of our moments about B,

$$Rl - Wl - Tm = 0.$$

Let us assume that R is 2 tons, W is $\frac{1}{2}$ ton, l is 6 ft., and m is 4 ft. Then we have

$$(2 \times 6) - (\tfrac{1}{2} \times 6) - (T \times 4) = 0$$
$$12 - 3 - 4T = 0$$
$$4T = 9$$
$$T = 2\tfrac{1}{4} \text{ tons.}$$

From this example will be seen the reason for preferably taking a section line that passes through three of the members of the truss and taking moments about the point of junction of two of them. We thus have in our equation of the moments one unknown term only, and are thus able to find at once the value of the stress in the particular member which we desire to investigate.

In a similar way we can find the stress by the same method of sections in any other member of the truss. For example, if we wished to know the amount of the stress in BC, we could use the same sectional arrangement as in fig. 2, and take moments about the point F thus :—Let us call the vertical load at B, W_2; the stress in BC, P; the perpendicular distance from F to the vertical from B, l (it being the same as from B to the direction of W and R above), and the perpendicular from F to BC, p. Then we have—

$$(R \times 2l) - (W \times 2l) - (W_2 \times l) - (P \times p) = 0.$$

Let us assume $p = 6\frac{1}{2}$ ft., which it scales nearly, and $W_2 = 1$ ton, then we get

$$(2 \times 12) - (\tfrac{1}{2} \times 12) - (1 \times 6) - (P \times 6\tfrac{1}{2}) = 0.$$
$$24 - 6 - 6 - 6\tfrac{1}{2}P = 0.$$
$$6\tfrac{1}{2}P = 12$$
$$P = 1\tfrac{11}{13} \text{ ton.}$$

In a similar way also the stresses on parts of a Warren, a Whipple-Murphy, or a lattice girder, or, indeed, on any trussed form, can be found. The principle and the method are the same in all cases, and the student would do well to work out examples for himself, remembering that the sectional lines need not be

vertical nor even straight, but may be circular, or, indeed, of any curve, care being taken as a rule to pass through three members of the truss, although even this is not absolutely necessary if the line be so taken that all the intersected bars save one meet at the same point; thus, we could find the stress in C D, fig. 2, by taking a section line passing through A F, B F, C F, C D, and taking moments about F.

OBITUARY.

HERR F. BÖMCHES.—The death is announced of Herr Friedrich Bömches, Director of Harbour Construction and Chief Inspector of the Southern Railway (Austria). Herr Bömches died on March 22 at his residence at Döbling, at the age of sixty-eight. The new harbour at Triest, with which his name is mainly associated, was built under his direction. The increasing commerce of Triest made this work necessary, a harbour being required which should enable goods to be transferred immediately from railway to ship. The work was commenced in 1868 and finished in 1883, and cost 14,600,000 gulden. The harbour consists of two large basins, and another of smaller size enclosed by dams for petroleum-laden vessels. The basins are guarded by a dam 1,092 mètres long. Herr Bömches was equally industrious with his pen, and wrote several works on the subjects in which he had special knowledge. At the beginning of the year 1890 he was entrusted with the building of the new harbour at Varna. He was a Knight of the Order of Francis Joseph and of the Legion of Honour.

GENERAL BUILDING NEWS.

RESTORATION OF ST. CUTHBERT'S CHURCH, HAYDON BRIDGE. This church, which has been undergoing restoration for the past few months, has been re-opened. The old round-headed sash windows have been replaced with tall two-light windows. The ceiling, formerly flat and plastered, has been opened ont to the ridge and covered with new timber. The chancel has been enlarged by about 15 ft., and is covered with a panelled roof. The east window has been fitted with stained glass. Below the east window, a reredos of carved oak has been placed. The old gallery has been removed, and the tower opened out with a porch. A new pulpit, with carved oak and stone base, has also been erected. The whole work has been carried out from plans and designs by Messrs. Hicks & Charlewood, architects, Newcastle-on-Tyne.

CHANCEL, ST. GEORGE'S CHURCH, NOTTINGHAM.—A new chancel has just been consecrated at the Church of St. George, Nottingham. Plans were prepared by Mr. G. F. Bodley for the erection of a chancel, organ chamber, vestries, and side chapel, but for the present it has been found impossible to carry out the original scheme in its entirety. The chancel is furnished with new choir stalls and a reredos, and the organ chamber is situated on the north side. Vestries, a side chapel, and other smaller details have yet to be added.

ESTABLISHED CHURCH, TORRY, ABERDEEN.—A new Established Church is to be erected at Torry, in Walker-road. Only the nave or main part of the structure will be proceeded with at this stage, although the remainder, consisting of the transept and semicircular apse, will be added as soon as the funds will permit. The new church will be cruciform on plan, consisting of the nave and east and west transept, with a semicircular apse at the rear. The walls will be of grey granite—square faced rubble—with red granite dressings. When completed, the church will provide accommodation for about 800 worshippers; meantime space will be provided for 500. The total cost is estimated at 3,100*l.* Mr. Arthur H. L. M'Kinnon, Aberdeen, is architect.

TOWER, MAGHERALIN PARISH CHURCH, LURGAN.—The new tower and peal of bells in connexion with this church have just been dedicated. The tower was erected by Mr. J. Campbell, builder, Belfast, under the superintendence of Mr. Drew, architect, Dublin. The bells were cast to order by Messrs. Taylor, Loughborough.

RESTORATION OF ST. WINIFRED'S CHURCH, STAINTON.—The work of restoring the Church of St. Winifred, Stainton, near Doncaster, has been decided upon. At a meeting of the Restoration Committee Mr. J. D. Webster, of Sheffield, the architect to whom the restoration has been entrusted, received instructions to proceed with the works at once. The tender of Mr. James Fisher, of Eckington, was accepted.

RESTORATION OF ST. HELEN'S, AUCKLAND, DURHAM.—The interior of this church has just been restored, and the building was reopened on the 13th inst. The work has been carried out by Mr. Hudson and Mr. Bell, the carving being by Mr. Keelip, Bishop Auckland. The architects are Messrs. Hicks & Charlewood, of Newcastle.

RESTORATION OF KING'S CLIFFE CHURCH, NORTHAMPTONSHIRE.—The Church of All Saints, King's Cliffe, has just been reopened after restoration. At the time of the first restoration of the church in 1862 there was a stone staircase leading to the ringing chamber and rood loft, which has since given place to the present iron corkscrew stepway. The supplementary restoration and outside repair has not consisted of any serious structural alteration, only the rebuilding of the north porch on exactly the same lines as before, with the floor line restored to its ancient level. The stonework of the tower and spire has been repaired and pointed, and the repair and pointing of all the exterior stonework of the walls and parapets has been effected, while the lead roofs have been repaired and made secure against wet. The windows of the nave and aisles have been repaired and restored with their original ironwork, and the best of the old glass re-used and made up with new to match. Fragments of the ancient stained glass have been found stowed away in the church and scattered here and there in the village, and have been fitted together as well as the broken and missing parts will admit, and put into the tracery heads of the windows. Some of these fragments were taken out of the east window of the chancel when it was filled with modern glass in memory of the late Archdeacon Kays Bonney, and others, it is said, came from Fotheringhay church. The font has been moved, and set up on a new stone step. The work has been carried ont by Messrs. Roberts Bros., builders, Stamford, under the direction of Mr. J. C. Traylen, Diocesan Surveyor, Stamford. A new clock has been provided out of the funds raised by the Victoria Jubilee Committee, and fixed on the tower. It was made by Messrs. Rowley Bros., London.

PROPOSED RESTORATION OF PARISH CHURCH, WELLINGTON.—We learn that All Saints' Church, Wellington, will shortly be closed for extensive alterations and repairs. It is proposed to remodel the interior altogether. The existing iron columns will be cased with marble. The new columns and entablature will be of the Doric order on the ground floor, and of the Corinthian order above. The pitch of the galleries will also be increased. One new feature will be a lofty oak screen, separating the chancel from the nave, and forming a morning chapel and chamber for the organ. The chapel will contain moveable seats, so as to permit of its being used for ordinary services. The organ, remodelled, will be brought down to the ground floor. The chancel itself will be raised, and new stalls provided for the choir. A portion of the galleries at the east end will be removed, but the seating accommodation will not be curtailed, as compensation will be found in the rearrangement of the seats. Mr. Dalgleish, of Wellington, is the architect.

PRIMITIVE METHODIST NEW SCHOOLS, ST. HELEN'S, LANCASHIRE.—The Primitive Methodist new Sunday-schools, erected in Kirkland-street, St. Helen's, at a total cost of about 1,500*l.*, were opened on the 14th inst. The main hall is 52 ft. by 31 ft. There are twelve class-rooms. The work has been carried out by Mr. Joseph Ellison, builder and decorator, of St. Helen's, from designs prepared by Mr. John Wilson, architect, of Runcorn.

CATHOLIC SCHOOLS, BRADFORD.—On the 11th inst. the new girls' and infant schools in connexion with St. Mary's Roman Catholic Church, Bradford, were opened. The new schools are two stories in height with basement, and have frontages to Wellington-street and Stott Hill. In the basement are two large rooms for young men's assemblies; while in another part of the basement are a laundry and kitchen. The ground floor is devoted to the infants' school, and this can be reached by three entrances without steps. The main room is 90 ft. long by 22 ft. wide, and there are four class-rooms. Cloak-rooms and lavatories are supplied at either end. The upper school, which is approached by two separate staircases, with short flights of ashlar steps, is 100 ft. long and 22 ft. wide, and contains six class-rooms. There is also a singing-room as well as lavatory and other accommodation. The interior woodwork is of best pitch pine. Messrs. Wray & Co., contractors, have executed the main portion of the building, and the other contractors are as follow:—Mr. W. H. Pick, joiner; Mr. M. Bland, plasterer; Messrs. Hill & Nelson, slaters; Messrs. Weardon & Co., plumbers; and Messrs. Duckett & Co., Burnley, lavatories. Mr. Edward Simpson is the architect. The total cost is about 6,000*l.*, and the schools will accommodate some 900 scholars.

WESLEYAN SUNDAY SCHOOLS, LOCKWOOD, YORKSHIRE.—The new schools (Wesleyan) which have been erected at Mount Pleasant, Lockwood, were opened recently. The basement is approached by the existing footpath and steps leading past the side entrance to the chapel, and also by a sloping footpath on the south side of the new schools, and contains an infants'-room, 36 ft. by 24 ft., with a square projecting bay, fitted up with an infants' gallery. Leading from this room is a flight of stone steps, 3 ft. 6 in. wide, up to the schoolroom floor; also a kitchen, 26 ft. by 13 ft., with a lift to go up to a class-room on the school-room floor. The principal entrances to the schools are from Pleasant-street, and face the Mount Pleasant Board Schools. There are separate entrances for boys and girls into lobbies, from each of which there is a flight of stone steps leading to the gallery and an entrance to the assembly-room. The assembly-room is 54 ft. 3 in. long by 36 ft. wide, 29 ft. 6 in. high to the wall-plate, and 38 ft. to the ceiling. At the back is a rostrum. On each side of the rostrum are steps which lead forward to the side galleries. The following class-rooms have been provided:—On the ground floor a library, a lecture-room fitted up with a small rostrum, connected with the chapel by means of a covered gangway, and having a separate external entrance, and five class-rooms, all entering direct from the school-room. Seven more class-rooms enter from the gallery floor. A second gangway communicating with the chapel gallery is arranged at the level of the gallery floor. The heating is on the low-pressure hot-water system. The work has been carried out from plans prepared by and under the supervision of Mr. B. Stocks, architect, by the following contractors:—Messrs. T. Bottomley & Son, masons, Lindley; Messrs. H. Hollingworth & Son, joiners, Moldgreen; Messrs. D. Taylor & Sons, plumbers, Lockwood; Messrs. T. Longbottom & Sons, slaters and plasterers, Lockwood; Mr. Richard Heaton, painter, Paddock; Mr. Frederick Milan, heating and whitesmith's work, Lockwood. The total cost is expected to be about 4,000*l.*

COTTAGE HOSPITAL, BISHOP AUCKLAND.—A cottage hospital will shortly be erected in South-road, Bishop Auckland. The hospital will be 150 ft. by 90 ft. The building will be set back 30 ft. from the road, and the principal entrance will face the workhouse. On the right of the vestibule will be the male and female wards, each containing four beds, and having a southern aspect, whilst between two wards the nurse's room will be situated. The bath and lavatory accommodation will be arranged in close proximity to the wards, and the water-closets, slop-sinks, &c., will be shut off from the wards by ventilated short passages. On the left of the vestibule will be the matron's room. On the north-west will be the surgeon's room and dispensary, whilst the operating room will be entered from the hall on the east. The kitchen, scullery, larder, mortuary, and disinfectant rooms will face the north. Three bedrooms will be provided on the first floor for the matron and attendants. The estimated cost of the building is under 2,000*l.*, the architect, under whose supervision the work will be carried out, being Mr. James Garry, West Hartlepool.

FIRE STATION, EDINBURGH.—At the sitting of the Edinburgh Dean of Guild Court on the 7th inst., plans were passed for a modern fire station situated at the Cattle Market, Lauriston, the cost of which will be 23,000*l.* The frontage to Lady Lawson-street and Lauriston-street extends to 270 ft. The fire station proper is next Lauriston-street. The engine house has four arched openings. There is stabling accommodation behind each fire engine. Provision has been made for dealing with the construction of fire apparatus on the premises, and workshop accommodation will be provided for fitters, blacksmiths, joiners, painters, and hose repairers. The telephone room adjoins the engine house, and a recreation room is also provided. The whole of the ground floor is devoted to the requirements of the department. The first floor comprises the fire-master's residence, superintendent's residence, mess room and dormitory for the single men, married men's quarters, &c. The second floor is set apart as married men's quarters. There are more quarters on the third floor, and a laundry quite apart from the dwellings. In the rear of the building is a hose tower finished with a wooden fleche. Beyond the engine room is an office for clerks and the fire-master's private room. A gymnasium adjoins the recreation room. Behind the main building is a court-yard for fire-drilling purposes, &c., and to the rear again is a secondary stable and miscellaneous out-premises for storage and other purposes. The architect is Mr. Morham, the City Superintendent of Works.

GIBSON PUBLIC HALL, GARELOCHHEAD, N.B.—The new public hall which has been erected on a site adjoining the Free Church, was opened on the 7th inst. The hall will seat about 350. Messrs. Barclay, of Glasgow, were the architects.

MECHANICS' INSTITUTE, CROSS ROADS, HAWORTH.—On the 9th inst. the memorial-stones of a new Mechanics' Institute for Lees and Cross Roads, near Haworth, were laid. Plans for the new building were prepared by Messrs. Judson & Moore, architects, Keighley. In the basement, in addition to the necessary offices, there is a gymnasium, the ground floor provides a library and committee-room, a conversation-room, a reading-room, and a billiard-room; whilst on the first floor there are five class-rooms, intended to accommodate the science and art classes. The contracts let amount to about 1,300*l.*

THE CAMBRIDGE UNIVERSITY UNION.—A scheme is prepared, with the assistance of Mr. Alfred Waterhouse, R.A., for an enlargement and renovation of the debating-hall at an estimated cost of at least 800*l.*, towards which past members of the Society are invited to contribute. The present buildings were erected about thirty years ago in place of the old rooms in Green-street. Mr. Waterhouse was the architect of the University Union debating-room at Oxford.

THEATRE, MANCHESTER.—A new theatre has just been erected in Manchester. The building, which has been named the Metropole Theatre, is situated in Ashton Old Road. The new house has been built from the plans of Mr. Alley, architect, of Altrincham, by Messrs. Broadhead & Co., contractors. The interior consists of pit, circle, and gallery, which have accommodation for four thousand people. The pit is reached from the street, the circle by an easy flight of stairs, and the gallery by inclines. The floors are of concrete, the

doors of iron, there are numerous exits, and a steel curtain divides the stage from the auditorium. The theatre is illuminated with the electric light from an installation on the premises. On the circle floor is a room extending the width of the building for use during the intervals for refreshment purposes.

WORKING-MEN'S CLUB, KETTERING.—A concert-room, with skittle-alley underneath, has just been erected in connexion with the Working-Men's Club at Kettering. The new block covers a piece of ground 60 ft. by 45 ft., at the rear of the old buildings. The plans were drawn by Mr. H. B. Henson. The concert-room is 63 ft. by 43 ft. in dimensions, with dressing-rooms on either side of the stage. Mr. J. W. Hart was the contractor, and the total cost of the block will be about 2,000*l.*

COLCHESTER NEW TOWN HALL.—Lieutenant-Colonel Smith, of the Local Government Board, held an inquiry at Colchester on the 13th inst. into the application of the Corporation to borrow 36,000*l.* for a new town hall. The sum the Corporation sought to borrow excluded the cost of the Victoria Tower, which the present Mayor has promised to present to the town. The architect (Mr. John Belcher), produced the plans of the proposed new structure. Illustrations of the proposed building appeared in our issue of September 4, 1897.

FISH LABORATORY, ABERDEEN.— The Fishery Board for Scotland has approved of a plan prepared by Mr. John Rust, City Architect, of a laboratory to be erected at the Bay of Nigg in connexion with the Board's new fish hatchery. The building has a frontage of about 56 ft. and a breadth of some 27 ft. The laboratory, situated on the right hand side of the entrance measures about 25 ft. long by 18 ft. broad. At the other end of the building is the director's room, and behind the passage, and extending to the back of the building, is the museum. The remainder of the floor space behind the latter apartment is occupied by a small storeroom and a lavatory.

DEPTFORD BATHS AND WASHHOUSES.—The site of these baths, which were opened on Wednesday, has a double frontage, that to Laurie-grove being occupied by the new baths, whilst the other and main frontage to New Cross-road is reserved with about one-third of the area for a future Vestry Hall and Offices, which have been designed by the architect to make one whole with the present buildings. Entrances are provided for men and women on either side of a central ticket office. An extra exit is provided from the gallery to the first class swimming bath, which contains a water space of 110 ft. by 35 ft., with a capacity of 120,000 gallons. The gallery seats 450. There are dressing-boxes for sixty-seven bathers, with lavatory attendant's compartment and a shower bath and latrines. This bath is to be available alternately for ladies and gentlemen. The second class swimming bath measures 80 ft. by 27 ft., with sixty-one dressing-boxes and gallery over. In the front block next Laurie-grove are provided the first class men's slipper baths for fifteen; second class men's slipper baths for thirty; first class women's slipper baths for five; and second class women's slipper baths for ten. This block also contains a board-room 26 ft. by 18 ft., with superintendent's living room above. The public washhouse (with ironing-room) contains twenty-three separate cubicles, twenty drying horses, in which, by hot-air circulation, clothes will be dried in from twelve to fifteen minutes, and steam-driven centrifugal wringers. The towel laundry, with twelve separate drying horses, steam-driven wringers, washers, and mangles. A basement contains boiler-house, engineers' mess-room, and engine-room, with well and accumulator-room adjoining, three engines driving the well pumps, laundry machinery, and dynamos. The walls of the swimming and slipper baths and the laundries are faced with glazed bricks, with blue brick moulded cornices and dressings. All the departments have open roofs with wrought-iron principals, and are lighted by large central lanterns, that to the swimming-baths being augmented by side windows above the dressing-boxes, and the first-class bath has an end window in faïence and Portland stone. The dressing-boxes and gallery are in pitch-pine with iron balustrades. There is a high diving-board provided, to which a chute is to be attached. The swimming-baths are constructed with brick retaining walls and cement concrete bottom, the whole lined with Val de Travers asphalte with lining of glazed bricks. By means of a spray, under pressure from a copper sparge pipe at the shallow end of the baths, the dust and scum which invariably accumulate on the top of the water are driven off the surface into a trough at the deep end and carried away to the drains. The wastes are of sufficient capacity to empty the large swimming-bath in twenty and the smaller in ten minutes. The divisions between the private slipper baths are rubbed slate, those to the first class being enamelled. The baths are of white enamelled fireclay. Subways run round the swimming baths and under the ground floor slipper baths, in which run the hot and cold supplies, steam pipes, wastes, and drains. The valves in these, and the connexions to the slipper baths, are in these subways, and are thus easily accessible for examination. The supply to each department is capable of being disconnected without affecting the supplies to the remainder of the institution. The front elevation of the building is in red brick and Portland stone. The roofing throughout is of Welsh rag slating (from Port Dinorwic) The water for the swimming baths is heated by steam injection in the water inlet. As a supplementary means of heating the swimming baths steam injector pipes are run in casings flush with the bath walls to keep the water up to its original temperature, or to raise the temperature after the water had cooled through the night. The water for the slipper bath is heated by steam injection. The exhaust steam from the engines is condensed and passed back into the boilers in the shape of hot water, thus ensuring a saving of fuel and water, and obviating the annoyance of exhaust steam passing through the roof. The atmosphere throughout the building is heated by means of steam piping and radiators, and extract ventilators and steam-driven fans to ensure circulation. The well has been sunk, 8 ft. in diameter, to the level of the chalk stratum, lined with cast-iron cylinders thence continued with a 24 in. open boring to a total depth of 250 ft. The pumps are double action and yield a supply of 36,000 gallons per hour, which, with the help of an 80,000 gallon cast-iron storage tank over the laundry, fills the large swimming bath in an hour, so reducing to the smallest limits the loss of time and public use during the change of water. The pumps are driven from a horizontal engine by means of belting. An electrical installation has been provided with a 35 h.-p. vertical engine and duplicate dynamos one being an auxiliary driven from the well engine when not required for driving the pumps. The dynamos can be driven to charge the lamps direct, or switched on to the accumulators, which are provided with a capacity of lighting 100 lamps for 10 hours. The swimming baths are fitted with patent 150 c.-p. incandescent lamps, the general lighting being by 16 c.-p. incandescent lamps. Mr. Thomas Dinwiddy has acted as architect to the Commissioners throughout. The builder is Mr. Holloway, of Deptford, and the building contract sum was 32,950*l.*, including the engineers' sub-contracts secured by Messrs. Moorwood, Sons, & Co., of Sheffield and London, which included the boilers, laundry machinery fittings and engine and slipper baths, and water services throughout. The well contract with engine and pumps amounted to 2,645*l.*, and was entrusted to Messrs. Tilley & Sons, of Walbrook. The electric light installation with engine, dynamos, and accumulators was carried out by Messrs. Joel & Co., of South Molton-street, at a contract sum of 1897*l.*

SANITARY AND ENGINEERING NEWS.

PIER, THE SANDBANKS, BOURNEMOUTH. — The new pier adjacent to the Haven Hotel, at the Sandbanks, has just been opened. The pier was built by Messrs. Fasey & Sons, of London. The structure is supported on screw piles with a platform of steel girders, which are decked over with pitch pine. The gates and fences were supplied by Messrs. Howell & Co., Limited, of Poole, and the turnstiles by Messrs. Bayley & Co., of Manchester. The length of the deck of the pier is 92 ft. The fenders are composed of greenheart piles. Seats are provided. The entrance, at which a toll-house is situated, has been tiled by Messrs. Carter & Co., of Poole. The width of the pier at the sea end is 26 ft., and at the entrance 10 ft. The level of the pier is 5 ft. above high water. The architects of the pier are Messrs. G. Sanders & Goodger, of Bournemouth.

PROPOSED SEA WALL AND ESPLANADE, BOGNOR. —On the 5th inst., at the offices of the Bognor Urban Council, Mr. Herbert H. Law, an Inspector of the Local Government Board, held an inquiry into the application of the Council to borrow 2,000*l.* for the construction of a new sea wall and esplanade at the west end, near the Black Mill. Mr. O. A. Bridges, Surveyor, laid before the inspector plans of the proposed improvements, and gave particulars concerning the construction of the new sea wall and esplanade, which would be a continuation of the old part, and of the same width.

GRAVING DOCK, TROON, N.B.—The new graving dock at present in course of construction at Troon Harbour is now nearing completion. The engineers of the works are Messrs. M'Taggart, Cowan, & Barker, Glasgow; and the contractors are Messrs. George Lawson & Son, Blairbeth, Rutherglen.

ABERDEEN WATER SUPPLY.—A meeting of the Water Committee of the Aberdeen Town Council was held on the 12th inst., when Mr. Dyack, Burgh Surveyor, submitted the report he had prepared with regard to the state of the aqueduct which conveys the water to the city. The committee then discussed the matter of substituting cast-iron pipes 8 ft. 6 in. in diameter for the cement aqueduct. The total cost was estimated at 126,000*l.* The committee came to no finding in the matter.

MANGOTSFIELD SEWAGE WORKS.—These works, which have been carried out under the direction of Mr. Walter le Maitre, C.E., of Bristol, were publicly opened on the 6th inst. The endeavour has been to carry out complete purification works upon a limited area of ground. After passing the detritus and screening chambers, the sewage—of a strong domestic character with some manufacturers' and slaughter-house refuse—is treated with ferozone, from two to three grains per gallon being found sufficient; it then flows through horizontal inlet pipes to 15-in. vertical tubes in the centre of the Candy circular upward-flow precipitation tanks, and falls within two feet of the bottom on to spreading plates. There is an outer cylinder 5 ft. in diameter, reaching from about 6 in. above water level to 6 in. below the spreading plates; by this means, further contact with the ferozone is given, and at the same time the precipitated solids overlying the bottom of the tank are not disturbed by the incoming sewage; a large volume is thus enabled to be rapidly dealt with, a continuous flow is maintained, and the effluent delivered without loss of level. The tanks, two in number, are capable of dealing with a flow of one million gallons daily, and are fitted with Candy's patent automatic sludge removal apparatus; each tank is 24 ft. in diameter, with 15 ft. 6 in. depth of sewage, the total area occupied by them being about 64 square yards. After leaving the tanks the effluent passes through clarifiers, of which there are three, each 7 ft. in diameter by 8 ft. high. The space occupied by these clarifiers (which are capable of dealing with a similar volume of sewage as the tanks) is about 63 square yards. The effluent from the clarifiers runs on to concentrated polarite filters, which can deal with 1,500 to 2,000 gallons per square yard per 24 hours. The superficial area of polarite filters is about 480 square yards, so that the purification installation for purifying 1,000,000 gallons per day is contained within a total area of about one-sixth of an acre. The sewerage and sewage disposal scheme, which includes eighteen miles of sewers, has been completed under Mr. Le Maitre for less money than the contract price. The contractor for the work is Mr. H. Roberts, of Birmingham, and the purification process adopted is that known as the International.

THE NATIONAL REGISTRATION OF PLUMBERS.—Dr. Matthew Hay, Medical Officer of Health for Aberdeen, presided at the annual meeting of the District Council for the counties of Aberdeen, Kincardine, and Banff, which was held at the Gordons College, Aberdeen, on Saturday last. The Chairman, in moving the adoption of the report, said that last year had been characterised by as much vigour in the movement as any previous year, if they had regard to what had gone on all round the country. The two most notable events of the year, no doubt, were the submission of the Plumbers' Registration Bill in Parliament and the preparation of the model regulations and by-laws for the drainage and plumbing work of buildings. The Bill more nearly reached the point of passing than ever it did before, coming to the third reading, when it was "talked out" on account of some slightly factious opposition. Mr. A. B. Robertson seconded the adoption of the report, which was agreed to. Mr. Kenneth Cameron, Sanitary Inspector of Aberdeen, moved:—"That this meeting, believing that the registration of plumbers under Parliamentary sanction would greatly promote the public health by helping to ensure sound plumbing and drainage, and that the voluntary system at present in force, although accomplishing much good, does not adequately meet the purpose in view, resolves to cordially support the Plumbers' Registration Bill at present before Parliament, subject to suggestions, if any, for its improvement which the District Council may make, and instructs the Council to use its utmost endeavour to aid the passage of the Bill through Parliament." Mr. J. F. Anderson seconded, saying that not only would the whole trade be in a much better position if the Bill passed, but the public even more so. Mr. R. G. Wilson, architect, proposed:—"That this meeting being of opinion that the model regulations and by-laws for the drainage and plumbing work of buildings prepared by a Committee of the six District Councils of the National Registration of Plumbers in Scotland, and recently published by authority of the Councils in congress, provide a reliable and well-considered code of regulations for such work, resolves that it is desirable in the interests of the public health that such regulations should be adopted and put into operation by all Municipal and Rural Authorities within this district as soon as may be practicable." They had by-laws of their own, he said, for some time in Aberdeen, and were working smoothly under them; but it was different when they went outside the city. They had nothing there to guide them, and he hoped some uniform system such as this would be adopted throughout Scotland. The resolution was agreed to.

CITY AND SOUTH LONDON RAILWAY.—The electric lifts for the new Islington extension of this railway are being made by the United Ordnance & Engineering Company, Limited, of London and Erith, with whom Easton, Anderson & Golden, Limited, are now incorporated. Each lift will be fitted with their patent gear, and will be capable of carrying about seventy passengers, and the average stroke will be 72 ft. The current required for working will be supplied from the generating station of the railway company.

STAINED GLASS AND DECORATION.

WINDOW, ST. HELEN'S, AUSTERFIELD.—A stained-glass memorial window has lately been fixed in St. Helen's Church, Austerfield. It is a three-light window containing standing figures which represent St. Peter and St. Hugh of Lincoln, with the Virgin Mary in the centre. Below these figures, which are placed on a "quarry" background, are the arms of

the dioceses of York, Southwell, and Lincoln, whose cathedrals are dedicated to St. Peter, the Virgin Mary, and St. Hugh. The parish of Austerfield having been at various times in these three dioceses. The work has been designed and executed by Mr. Herbert Bryans, of London.

JUBILEE WINDOW, MALVERN.—The unveiling ceremony of the Jubilee window, the gift of the women of Malvern, took place at the Priory Church recently. The window is at the back of the altar in St. Ann's Chapel, which is situate on the south side of the church. The history of the Priory in brief is depicted. Mr. C. E. Kemp was the designer.

CHRIST CHURCH, EBBW VALE.—A two-light window has just been fixed at the east end of the south aisle of Christ Church, Ebbw Vale, Mon., the subjects treated being the "Resurrection" and "Our Lord as the Good Shepherd." It has been placed as a memorial of a former vicar of the church. The work was carried out by Jones & Willis, of Birmingham and London.

ST. JAMES' CHURCH, HANDSWORTH.—A memorial window has recently been erected in the south aisle of St. James' Church, Handsworth. The subject of the window is the Raising of Lazarus, and, in the tracery, Our Lord, Mary, and Martha—"She hath done what she could." The window was designed by Mr. T. W. Camm, and executed at his studio at Smethwick, Birmingham.

CHURCH OF ST. MARY-THE-VIRGIN, ALDERMANBURY, E.C.—This church of Wren's has recently been entirely redecorated. It consists of a nave and two side aisles divided from the nave by composite columns. In designing the interior colour scheme the general aim has been to keep the decorations in harmony with and subordinate to the architectural features of the building, while on account of the absence of stained glass it was felt that a somewhat dark tone of colouring was desirable. The nave ceiling is of the barrel-vault type, and has been tinted a delicate ivory, relieved with bands of light sage-green and terra-cotta, the main arch-ribs over the columns being light terra-cotta with cream-coloured enrichments, and the modelled plaster work light green and fawn colour. The main cornice, which extends down each side of the nave at the springing of the vaulting immediately over the columns, has been treated in light shades of terra-cotta, ivory, and cinnamon, with the enriched work gilded. The aisle ceilings are in harmony with that of the nave. The walls have been painted a medium Pompeian red, the upper part with panelled ornamentation, and bands of lighter colour and stencilled decoration between the windows, the dado being a dark green. The arches of the windows have been formed into panels in two tints of red, with gilded ornament forming imposts. The east end wall has been selected for the more elaborate part of the design, and has been treated in lighter shades of green, with diaper ornament in cream colour and light green, and emblems on either side of the large east window, in painted panels of an architectural character, with bands of ornament on a gold ground above and below. The lower part of the reredos has been decorated with diaper ornament in light green, terra-cotta, and gold on a cream ground, with tapestry dossal hangings on either side. The altar-cloth has been specially designed by the architect in red antique velvet with gold embroidery and appliqué work; three painted panels have also been placed in the reredos. The columns have not been painted, but have merely had all former colouring matter removed from them, so as to show the original face of the stone. Three pairs of old oak doors, the only remaining portion of the original woodwork, have been restored to the light of day, the paint with which they have been thickly covered having been removed, and the original surface laid bare. An interesting discovery was made with regard to the front oak doors. They had been concealed under a deal painted casing, and on the removal of this, a large number of lead bullets were found embedded in the oak. The whole of the recent works, which include the provision of electric light, have been executed from the designs and under the superintendence of Mr. Lewis E. G. Collins, architect, and the contractors were Messrs. Campbell Smith & Co. The church was re-opened for Divine Service on Wednesday, April 6.

FOREIGN.

FRANCE.—M. Scellier de Gisors, Inspector-General of *Bâtiments Civils*, has been elected Chief Professor of Architecture at the Ecole des Beaux-Arts, in place of the late M. Ginain.——A fine altar has just been inaugurated in the Church of the Sacré Cœur at Montmatre. It is from the designs of M. Rauline, and is composed of marbles and onyx, the colours being harmoniously combined with embossed leather work, bronze inlay, enamels, and precious stones.——M. Georges Achard, pupil of M. Falguière, has been commissioned to execute an allegorical group in bronze, which is to be presented to the Emperor of Russia by the commercial and industrial community in Paris. The group represents Nicholas II., led by Peace, who holds the French and Russian flags and an olive branch. On the pedestal is a Mercury, an allegorical figure of Industry, and two children with arms entwined.——The Académie de Médecine de Paris, which has for some time been occupying a building belonging to the Hôpital de la Charité, Rue des Saints-Peres, will shortly be transferred to a large building in the Rue Bonaparte, the fitting up of which will necessitate an outlay of 1,500,000 fr.——The architectural jury of the Société des Artistes Français is composed this year of MM. Coquart, Daumet, Deglane, Garnier, Laloux, Loviot, Mayens, Moyaux, Alfred Normand, Pascal, Raulin, Redon, Roussi, and Vaudremer.——The Bayeux municipality have commissioned MM. Leduc and Tony-Noël to execute a bronze statue of the poet Alain Chartier, which is to be placed in one of the squares of the little town. The inauguration will take place in July.——The jury on the open competition for the building of a school for young girls at Lyons, have awarded the first prize to M. Delorme, architect, of Lyons; the second prize to MM. Sandier & Cornet, of Lyons and Paris; the third prize to M. Tournaire, and the fourth prize to M. Calinaud, both of Paris.——The Government have decided to make a line from Bort to Neussargues, which will go through the Department of Cantal. This line will not only be of use for the industry of the country, but will be a great boon to the numbers of tourists who every year flock to the picturesque neighbourhood of the central plateau.——The subject chosen for this year's competition by the "Société Académique d'Architecture de Lyon" is "Some Baths at the meeting of the Rhône and Sâone." —— The death of a clever sculptor, M. Ch. Aimé Irvoy, has just been announced, at the age of seventy-four. He was a pupil of Ramey and of Dumont, and, in 1854, he obtained the second prix de Rome. In 1856, he was elected Director of the Ecole de Sculpture Architecturale at Grenoble. Amongst his numerous works we may mention a statue of "Ronsard," which is at Vendôme; a "Sentinelle Gauloise," which is at Grenoble; the front of the Hospice Civil, in the same town; and the marble medallion of General de Miribel in the Grenoble cemetery; also a bust of Barnave, which is in the Museum at Versailles. M. Irvoy died at Grenoble.——The death is also announced of M. Alphonse Girodin, painter, at the age of eighty-six. He is known principally by his religious paintings, and a large one entitled "le Martyre des Macchabées" is in the Musée Saint-Pierre at Lyons.

AUSTRIA.—The castle in which the picture gallery of the Belvedere, Vienna, was situated is being adapted (now that the pictures have been removed) as a residence for a member of the Imperial family. The work is proceeding rapidly, and it is expected that it will be finished in the course of the autumn. ——The Council of Vienna proposed to erect municipal brickworks, and a site was chosen. This, however, having been found too expensive, the matter has been allowed to drop.——Klosternenburg (and probably the neighbouring Kritzendorf) is to be lit with electric light, and a depôt is to be erected there at a cost of 200,000 florins.——Messrs. Siemens & Halske have been commissioned to carry out the work of erecting a central electric station at Vöslau; the amount of their tender was 150,000 florins.——The site for the theatre at Graz has been chosen; the cost of the building is to be 400,000 florins.——A new water supply is to be introduced into Grein, Upper Austria, at a cost of 15,000 florins, as a memorial of the Imperial Jubilee.——A piece of land opposite the two school buildings in Ruppersdorf, Bohemia, has been acquired by purchase for the erection of a new church.——A new church is also to be built in the newly consecrated cemetery at Neu-Bydzjov, in commemoration of the Imperial Jubilee.——A meeting of those interested was lately held in Vrbno to discuss projects for making the River Moldau navigable. It was decided to make the present river-bed into a canal; the counter proposition to run a canal from Chvatejrub to Obrjistvi was emphatically negatived.——The cathedral at Agram, an eleventh-century building, one of the largest and finest buildings in Austria, has been undergoing restoration ever since 1880, when it was seriously injured by an earthquake. The two towers, which are to reach a height of 107 mètres, will be erected this year, according to the plans. The cost of the work has up till now amounted to 3,000,000 gulden.

WORKING MEN'S COLLEGE, MELBOURNE.—We have received the prospectus for 1898 of the Working Men's College, Melbourne, which appears to cover a large course of instruction, including civil, mechanical, and electrical engineering, surveying, geometry, architecture and architectural drawing, &c.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—Messrs. Doulton, of Lambeth, have removed their Manchester depôt to Temple Chambers, St. James-square, Manchester, where they have opened large showrooms for the display of glazed faience fireplaces, mantels, baths, lavatory fittings, &c.—— Dick's Asbestos Co., Canning Town, have opened City offices at 51 and 52, Fenchurch-street, E.C.

WORKMEN'S COMPENSATION.—From the report of the Sun Life Assurance Society, just issued, it is interesting at this juncture to observe that this institution has established a special department for the transaction of employers' Liability and workmen's compensation insurance, as well as for personal accident business.

NEW ALTAR, ST. MARY'S ROMAN CATHOLIC CHURCH, MORECAMBE.—A new altar has just been erected in the Lady Chapel of this church by Messrs. Boulton & Sons, Cheltenham, from a design by Messrs. Pugin & Pugin, London. It is in the Gothic style, the chief material used in its construction being Caen stone, with dark polished marble columns. The subject of the altar frontal is a carved representation of the Annunciation. In the reredos are sculptured panels, one on each side of the tabernacle, the subjects being "The Flight into Egypt" and the "Entombment of Our Lord." The sculptured figure in the centre niche over the tabernacle is of white statuary marble, and represents Our Lady of Dolors, to whom the church is dedicated. The front of the tabernacle is an ornament of *repoussé* lacquered brass work with the letter "M" (Mary) crowned in the centre.

PRESENTATION TO AN ENGINEER.—Mr. John Ward, C.E., who for nine years has held the position of Deputy City Surveyor of Sheffield, was entertained to dinner at the Cambridge Hall, Sheffield, on the 15th inst., on the occasion of his appointment as Borough Surveyor and Engineer of Derby. The City Surveyor (Mr. C. F. Wike) occupied the chair, and was supported by Mr. Ward, Mr. H. Mallyon (Manager of the Tramways), Mr. A. Llewellyn Tell (Resident Electrical Engineer), Mr. J. Jackson (Superintendent of the Health Department), Mr. T. W. Newbould (Chief Architectural Assistant, Mr. J. T. Hall (head of the Sewers' Department), Mr. E. A. Green (Chief Building Inspector), Mr. W. T. Lancashire (Mr. Ward's successor), Mr. G. E. Vint and Mr. B. Powell (District Surveyors), and others. The City Surveyor proposed the health of the guest of the evening, which was responded to by Mr. Ward. "Other Departments" was proposed by Mr. J. T. Hall, and acknowledged by Mr. Mallyon and Mr. Fell. Mr. G. E. Vint proposed "The Visitors," to which Mr. Laing, J.P., Surveyor to the Colony of Sierra Leone, formerly District Surveyor for the Corporation, and Mr. W. C. Fenton, architect, late Chief Building Inspector, replied. Mr. Wike then made the presentation to Mr. Ward. It consisted of fish carvers, fish knives and forks, dessert knives and forks, and a spirit stand. It was accompanied by an address, bearing upwards of fifty signatures. There were also on view several marks of esteem which were presented to Mr. Ward a few days ago by the workmen of the Central District Highway Department.

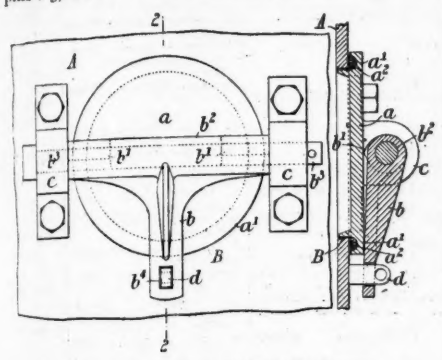
GLASGOW ARCHITECTURAL STUDENTS' VISIT TO DUNDEE.—The students attending the architectural and building classes at the Glasgow and West of Scotland Technical College visited Dundee recently, and inspected several of the principal buildings in the city. Amongst the buildings visited were the Albert Institute, St. Paul's Episcopal Church, the new Post Office, the Royal Infirmary, the Nurses' Homes, the new Royal Bank, the Pearl and Scottish Provident Insurance Buildings, the Old Steeple, and East Parish Church.

GLASGOW AND WEST OF SCOTLAND TECHNICAL COLLEGE.—During the session the following buildings and works have been visited on Saturday afternoons by students in attendance at the architecture and building construction classes in the above-named college:—Ruchill Hospital and the People's Palace (Mr. A. B. Macdonald, architect); the Western Infirmary Operating Theatres, &c. (Mr. John. J. Burnet, architect); the Clyde Ironworks, Tollcross; new offices, 41, Bothwell-street (Messrs. James Salmon & Son, architects); Messrs. James Howden & Co.'s new works in Scotland-street (Mr. Nisbet Sinclair, architect); Pollokshaws Town Hall (Dr. R. Rowand Anderson, architect); and Norwich Union Insurance Offices, St. Vincent-street (John Hutchison, architect). There was a large attendance at all the visits. On Monday, April 11, a party of forty students visited the following buildings in Dundee under the leadership of Professor Gourlay:—The Royal Arch; the old Custom House; the new Royal Bank in course of construction (Messrs. Peddie & Washington Browne, architects); St. Paul's Episcopal Church, erected 1853-1865 by the late Sir Gilbert Scott; the Albert Institute, by the same architect; and the Victoria Gallery by Mr. Wm. Alexander, the City architect; the new Pearl Insurance Offices; the Scottish Provident Insurance Offices; new bonded warehouses in the Seagate; new nurses' home and operation theatre at the Royal Infirmary; the new post-office, by Mr. W. W. Robertson, of H.M. Office of Works, Edinburgh; the Old Steeple, erected about the middle of the fifteenth century; the old cross of Dundee, near the steeple; and the East Church, where the new east window designed by Sir E. Burne-Jones and executed by Messrs. Morris & Co., was much admired. Another party of former and present students visited Durham for a few days at Easter to measure and sketch in the Cathedral, the castle, and other buildings in the city and its vicinity, including Finchale Abbey.

ELECTRIC LIGHT EXTENSIONS, WALLASEY.—On the 14th inst. Mr. Walter A. Ducat, Local Government Board Inspector, held an inquiry at the Public Offices, Egremont, with reference to the application of the Wallasey Urban District Council for powers to borrow 20,785*l.* for electric light extensions, 5,600*l.* for new water mains and meters, 1,182*l.* for widening and improving Seabank-road, Egremont, Withen's-lane and Zigzag-road. It was stated that 840*l.* profit had been realised from the electric

supply since the system was installed in January last year, and applications for electric energy were coming in such numbers that the Council could not meet the demand without extending their works. There was no opposition.

HEWENS' PATENT MANHOLE COVER.—This is a patent for ensuring tight pressure on a manhole cover to a tank or drain while rendering the cover easily removable, without the necessity of taking out screws or rivets. There are several patterns for different special purposes, but the one illustrated may be taken as representing the principle. After the cover is put in, the cross-bar, *b* 1 in diagram, is placed across it and secured into the brackets *c* by centre-pins *b* 3, with the arm *b* turned upwards; the arm *b*



Hewens' Patent Manhole Cover.

is then brought down into the position shown on section, and pinned down at *d*, while at the same time a cam on the heel of *b* presses down the cover tightly. To release the cover it is only necessary to remove the pin at *d* and release the arm, and remove the pin b^3 so as to dismount the closing arm b^3 from its bearings. The arrangement is simple and effective; and the cover, when closed, is held down by a powerful leverage obtained from the cam on the arm *b*.

IMPROVEMENTS IN THE CITY.—A report has been made by Mr. D. J. Ross, C.E., Engineer to the newly-formed Public Health Department of the Corporation upon the works that have been carried out in 1897—being the last year of office of the Commission of Sewers. Plans and estimates are prepared for widening Lower Thames-street, at its eastern end, to either 40 ft., 50 ft., or 60 ft., and similar alterations are entertained in respect of London-wall (north side), where some leases belonging to the Bridge House Estates will expire at midsummer of next year, and in respect of Fenchurch-street between Ironmongers' Hall and Cullum-street; by setting back certain frontages in Leadenhall, Fleet, and Fenchurch streets, together with Houndsditch, the widening of those thoroughfares has also been effected. A satisfactory report is given upon the experiment of lighting Great St. Helen's and Wood-street with the Welsbach incandescent gas lamps; it is contemplated to extend the system of electric lighting into the minor thoroughfares—in the main streets more than a third of the gas lamps are already dispensed with, the total number of electric lamps being 494.

PROPOSED IMPROVEMENTS AT CRIPPLEGATE.—Schemes have been drafted by the City authorities and the London County Council's Chief Engineer for effecting improvements in the district a portion of which lies within the limits of the recent fire. Scheme A provides—under existing statutory powers—for a widening of Jewin-street on the south side for its whole length, and to extend the new thoroughfare by a curve southwards to join Fore-street at St. Giles's Church. The Corporation estimate the net cost of that new street, about 300 yards long, at 606,500*l.*, if it were made 60 ft. wide, but if the width is reduced to 50 ft., or 40 ft., at 536,600*l.* or 432,600*l.* respectively. A supplementary scheme (scheme C) contemplates an extension of the street under scheme A, from the west side of Aldersgate-street to West Smithfield, to be 60 ft. wide, with a spur, 30 ft. wide, eastwards of the church of St. Bartholomew-the-Great into Long-lane. Scheme B, which, we gather, is prepared by Sir A. R. Binnie, comprises a new street, 60 ft. wide, to begin from the end of London-wall, at its junction with Wood-street, passing along Hart-street and Wood-street-square (both to be widened), across Well-street and Hamsell-street, and so, by a bend, to bring it into alignment with Edmund-place (to be widened along its entire south side), to reach Aldersgate-street. The net cost of scheme B is estimated by the Council's officers at 536,000*l.*; the two schemes A and B are those referred to in our report, p. 350 *ante*, of the County Council's meeting on Tuesday, April 5. The street of scheme B traverses the old City wall within a few yards, southwards, from the tower or bastion at its north-western angle in St. Giles's churchyard. Well-street, originally Crowder's Well-alley, derives its name from the ancient well, cited by Stow, which Richard Whittington's executors coped in and arched over with stone, making stone steps for a descent to the spring in the bank of the ditch just outside the wall. The well lay between Well-street and the present churchyard, south of St. Giles's vicarage-house, and the approach to it may be found, we believe, beneath the ruins of one of the burnt warehouses in that street.

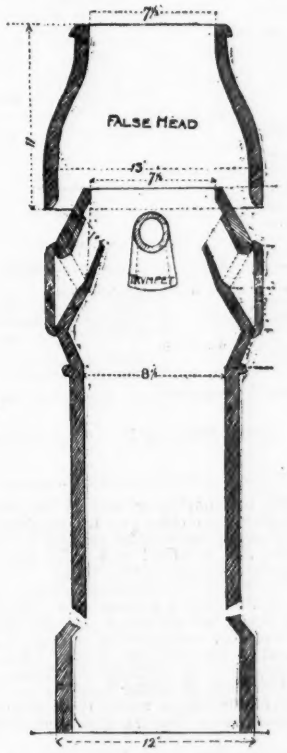
THE SLATE TRADE.—Reports have been circulated of possible friction at the Penrhyn Quarries in connexion with the quarrymen's holiday on May 2, but we do not anticipate any disturbance, especially bearing in mind the accounts of the strike fund which have been recently published. The total amount collected from all sources was 19,161*l.* odd; on the other hand the men lost eleven months' wages, about 150,000*l.* The visible supply of slates is rather larger than at the corresponding period of last year, but trade promises well as the season advances.

"EXCELSIOR" WALL AND CEILING SLABS.—These are a light kind of slab, of incombustible material, which can be made in large or small sizes, and can either be used for partitions or be nailed to ceilings as an incombustible shield below the joists. When used as partitions the plates are set up on edge and thin iron rods passed through holes in the plates to connect them; the partition is also additionally strengthened by clips built in and turned up, or round angles. The surface of the slabs is roughed for a plaster key. The material appears to be worth the attention of architects. The patentees are Messrs. Van der Vygh Bros. of Amsterdam, and their agent in London is Mr. A. J. Van Ostveen, who intends in a few days to have a test exhibition of the resistance of the material to fire.

THE "NOVELTY" THEATRE, GREAT QUEEN-STREET.—Some extensive alterations, with repair and decoration, are about to be carried out for Mr. W. S. Penley, from the designs and under the superintendence of Messrs. Murray & Foster. The theatre was planned and designed by Thomas Verity (*ob.* May, 1891) and opened on December 9, 1882, under the name it now bears; it has since been known for a while as "Jodrell's," and we understand that its name will again be changed.

MESSRS. RAPHAEL TUCK'S NEW PREMISES.—Messrs. Patman & Fotheringham ask us to mention that they are the contractors for this building, of which the foundation stone was laid the other day, as mentioned in our columns already.

THE "CERTAINTY" SMOKE-CURING COWL.—This is one more addition to the almost innumerable array of cowls which have been devised for the cure of one of the most troublesome nuisances known to the modern householder—a smoky chimney. The ideas it combines are by no means new, consisting as they do of a cone or false head over the top of the cowl and trumpet-mouthed upward inclined openings in the sides of the cowl or shaft. We do not remember to have seen a combination of these devices in one cowl before, although experience has proved that each of them has a value in certain



The "Certainty Company's" Chimney Cowl.

cases, but it is beyond question that no form of cowl will cure all cases of smoky chimneys. For the purpose of resisting a downward current of air on the top of a chimney, there can be no doubt that this may be classed amongst the useful palliatives of the evil.

PIPE CLIPS.—Messrs. Chas. Winn & Co. (Birmingham) send us a specimen of their wrought-steel pipe clips, made in various sizes, for fixing pipes to walls. They have a good appearance, and are at once light and strong, and well fitted for their purpose.

THE METROPOLITAN TABERNACLE BURNED.—This well-known edifice, so closely connected with the work of the late Rev. C. H. Spurgeon, was practically burnt to the ground on Wednesday last, the 20th inst. The conflagration is generally believed to have been due to an over-heated flue. It was a solid edifice of stone and brick. The principal distinguishing feature externally was the portico, the entablature and pediment of which are supported by six Corinthian columns. The building was erected in 1860-61 from the designs of Mr. W. W. Pocock, at a cost of about 32,000*l.*

CAPITAL AND LABOUR.

BARRY BUILDERS AND THEIR MEN.—A meeting of the Barry Builders' Association was held recently, under the presidency of Mr. G. Rutter, when a deputation was appointed to meet the operative stone-masons to discuss certain alterations the Association is desirous of making in a code of working rules submitted to them for consideration and approval. A deputation was also appointed to meet another deputation of the Operative Society of Plasterers to discuss certain alterations and additions they are desirous of making in their existing working rules. A discussion took place as to the advisability of the Association being affiliated to the West of England and South Wales Federation of Building Trades' Employers, and the National Association of Master Builders of Great Britain, it being pointed out that it would be advantageous in case of any dispute arising. The secretary (Mr. J. Prout) was instructed to write and obtain further particulars as to joining the same, and to report at the next general meeting.

THE DISPUTE IN THE BIRMINGHAM BRICK TRADE.—The dispute in the Birmingham brick trade was settled on the 13th inst. at a conference between six representatives of the masters and an equal number of representatives of the men. It will be remembered that the men belonging to the National Union of Gasworkers and General Labourers recently served notices upon the brick manufacturers in the district demanding the formation of a Conciliation Board, and an advance of 10 per cent. on the piece-workers' wages and ¾d. an hour on those of the day workers. After a long discussion a compromise was effected. The men will receive an advance in their wages. The agreement will hold good for two years. With regard to the proposed constitution of the Conciliation Board, it was decided to resuscitate the old Board to deal with trade matters until the first week in May, when another meeting will be held to further consider the subject.

MEETINGS.

FRIDAY, APRIL 22.

Architectural Association.—Mr. H. B. Creswell on "The Morality and Economy of Competitions." 7.30.

Royal Institution.—Mr. W. H. M. Christie, M.A., on "The Recent Eclipse." 9 p.m.

Institution of Civil Engineers (Students' Meeting).—Mr. M. W. Henty on the "New Cut Swing-Bridge, Swansea." 8 p.m.

SATURDAY, APRIL 23.

Sanitary Institute (Demonstrations for Sanitary Officers).—Inspection at Beddington Sewage Farm, Croydon.

Edinburgh Architectural Association.—Visit to St. Mary's Cathedral, Chapter House, Singing School, and Miss Coates' House.

St. Paul's Ecclesiological Society.—Visit to the Church of St. Margaret, Lothbury. 3 p.m.

MONDAY, APRIL 25.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—(1) Inspection at the St. Pancras Destructor Station, Georgiana-street, Great College-street, Camden Town. 3 p.m. (2) Professor H. Robinson on "Sewerage and Sewage Disposal." 8 p.m.

Society of Arts (Cantor Lectures).—Dr. D. Morris on "Sources of Commercial India-rubber." II. 8 p.m.

TUESDAY, APRIL 26.

Royal Institution.—Mr. T. C. Gotch on "Phases of Art; Past and Present." II. 3 p.m.

Institution of Civil Engineers.—Annual General Meeting of Corporate Members; Report of Council; Election of Council and Auditors. 8 p.m.

WEDNESDAY, APRIL 27.

Architectural Association Discussion Section.—Mr. J Humphrey Jones on "Hospitals: principally those for Isolation purposes."

Institution of Mechanical Engineers.—Ordinary Genera Meeting. Inaugural Address by the President, Mr. S. W. Johnson. 7.30 p.m.

Society of Arts.—Captain W. de W. Abney, C.B., on "Photography and Colour Printing." 8 p.m.

Liverpool Engineering Society.—Annual Report of Council; Election of Officers; Paper by Mr. Andrew Hamilton on "Diagrams as Illustrating Ship and Engine Performances." 8 p.m.

THURSDAY, APRIL 28.

Sanitary Institute.—Mr. Charles Jones on "Scavenging, Disposal of House Refuse." 8 p.m.

Institution of Mechanical Engineers.—Anniversary Dinner. Freemason's Tavern.

Society of Antiquaries.—8.30 p.m.

Civil and Mechanical Engineers' Society.—Mr. H. W. Ravenshaw on "The Economy of Mental Labour in Relation to Engineering Calculations." Hotel Victoria 7 p.m

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
*Laying-out Property	Palace and Derby Castle, Ltd.	25*l.* and 10*l.*	May 7

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c. Supplied by	Tenders to be delivered.
*Main Drainage Works	Waterford Corp.	M. J. Fleming, Town Hall	April 25
*New Sewers, Sewer Pipes, &c.	do.	do.	do.
Additions to Westfield House, Sowerby Bridge		R. Horsfall & Son, Archt. 15, George-st. Halifax	April 26
Sewerage Works (Contracts 1-3)	Knottingley U.D.C.	J. Richardson, C.E. 5, Central-chmbrs. Leeds	do
Two Footbridges, Neath and Ely	G. W. R. Co.	G. K. Mills, Paddington Station, W.	do.
Sewerage Works, Mersey-rd. West Didsbury	Withington U.D.C.	A. H. Mountain, C.E. Council's Offices	do.
*Road Works	Tottenham U.D.C.	P. E. Murphy, 712, High-st. Tottenham	do.
	do.	do.	do.
*Cast Iron Pipe Water Main		J. Kirk & Son, Archt. Dewsbury	
Four Houses, Northfield Estate, Dewsbury			April 27
Street Works, Linthorpe-rd. &c.	Middlesbrough Corp.	F. Baker, C.E. Municipal-bldgs. Middlesbrough	do.
Sanitary Pipes, &c.	do.	do.	do.
Road Materials, &c.	Hailsham R.D.C.	J. Huxley, Dist. Surv. Winster House, Hailsham	do.
Dwelling Houses, &c. Firzean Estate, Aboyne, N.B.		Cochran & Macpherson, 152, Union-st. Aberdeen	do.
*Sewer Pipes and Disposal of Sewage	Hambledon R.D.C.	R. B. Grantham & Son, 23, Northumberland-avenue	do.
*York Paving, Guernsey Granite, and Broken Flints	Bermondsey Vestry	F. Sumner, Town Hall, Spa-road, S.E.	do.
*Two Water Vans and Two Material Carts	do.	do.	do.
*Works and Materials, Various	Croydon R.D.C.	Town Hall, Croydon	April 28
Market Stands, &c. St. James' Market	Bradford Corp.	J. H. Cox, Town Hall, Bradford	do.
Factory, Bedminster, Bristol	E. S. & A. Robinson, Ltd.	Crisp & Oatley, Archt. 31a, Clare-st Bristol	do.
Forty-five Houses, Waverley-road, Bradford		J. H. Dixon, Archt. 90, Heap-lane, Bradford	do.
Thirty-six Cottages, Queen-st.	Salford Corp.	W. R. Sharp, Archt. 28, Deansgate, Manchester	do.
Ward Block at Hospital, Southampton	Royal South Hants Infirmary	Young & Hall, Archt. 17, Southampton-st. Bloomsbury, W.C.	do.
*Filter Sand and Pea Gravel	Cuckfield R.D.C.	J. Mansergh, 5, Victoria-street, S.W.	do.
*Distempering, &c.	St. George's in the East Guardians	G. A. Wilson, Vestry Hall, Cable-st, E.	April 29
Two Shops, &c. Woodside, Halifax		M. Hall, Archt. 29, Northgate, Halifax	do.
Two Blocks Houses, &c. Mount Pleasant		H. B. Buckley, Archt. 8, East-parade, Leeds	do.
Three Houses, Dunkirk, Halifax	Batley Co.-op. Soc.	C. F. L. Horsfall & Son, Archt. Lord-st.-chmbrs. Halifax	do.
Church Restoration, Oldbury-on-Severn		Waller & Son, Archt. 17, College-green, Gloucester	do.
Church, Charleville, co. Cork	Rev. P. J. O'Callaghan	M. A. Hennessy, Archt. 74, South-mall, Cork	April 30
Shop, House, &c. Middle-st. Consett, Durham	J. Cockburn	W. S. Shell, Archt. Taylor-street, Consett	do.
School, Primrose Hill	Whitchurch (Glam.) Sch. Bd.	R. & S. Williams, Archt. Wharton-st. Cardiff	do.
New Road (1 mile) Strone-of-Callay, Blairgowrie	Perth C.C.	I. H. Anderson, 1, Leslie-st. Blairgowrie, N.B.	do.
Pair Villas, Melville-rd. Falmouth	G. Thomas	W. Swift, Archt. 38, Lemon-st. Truro	do.
*Twenty Almshouses	Geo. Woodfindin Almshouses	W. R. Bryden, 1, George-st Buxton	do.
*Steel Bridge (Three Spans of 58ft. each)	Sheffield Corp.	C. F. Wike, Town Hall	do.
*Brick Tank	Alton Gas & Coke Co.	F. Barnley, Manager, Alton, Hants.	May 1
Stables, &c. Corporation Yard, Backhouse-street	Darlington Corp.	Borough Surveyor, Town Hall	May 2
Additions to Schools, Aberdeenshire	Turriff School Board	W. F. Stewart, School Board Offices, Turriff	do.
Schools, Heath Town	Wednesfield S.B.	F. Hunter-Lines, Archt. Queen-square, Wolverhampton	do.
Four Houses, Southowram Bank Top, Halifax		Jackson & Fox, Archts. 22, George-street, Halifax	do.
Quarrying and Breaking Stone, Deeside District, Aberdeenshire		J. Milne, Surv. Aboyne	May 3
*Ten Cottages	Waltham Holy Cross U.D.C.	C. W. Wiggs, Council Offices, Waltham Abbey	do.
*Kerbing, Channelling, &c.	Lewisham B. of W.	Surveyor, Offices, Catford, S.E.	do.
*Washing Machinery	Barrow-in-Furness Guardians	J. Y. McIntosh, Cornwallis-street, Barrow	May 4

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c. Supplied by	Tenders to be delivered.
*Asphalte Paving	Westminster Vestry	G. R. W. Wheeler, Town Hall, Caxton-street, S.W.	May 4
*Isolation Hospital, Asylum, Parc Gwyllt, Bridgend		Giles, Gough, & Trollope, Archts. 28, Craven-street, Charing Cross, W.C.	do.
Main Conduit (8 miles)	Belfast Water Comrs.	Macassey, C.E. Waterwork's Office, Belfast	May 5
Additions to Schools, East Howle	Tudhoe (U.D.) School Bd.	W. Perkins, Archt. School Board Offices, Tudhoe	do.
Fire Station, Ingram-street	Glasgow Corp.	J. Lindsay, City-chambers Glasgow	do.
Parsonage, Gobowen, Oswestry		Shayler & Madoc-Jones, Archt. 19, Church-street, Oswestry	do.
Road Making and Drainage at Cemetery	Gorton U.D.C.	Borough Surveyor, Town Hall, Gorton	May 6
Three Mortuary Chapels, &c.	do.	do.	do.
Warehouse, Halifax		C. F. L. Horsfall & Son, Archt. Lord-street-chambers, Halifax	May 7
*Inland Revenue Office, Croydon	Commissioners H.M. Works		May 10
*Offices, &c. at Docks, Southampton	L. & S. W. Railway Co.	12, Whitehall-place, S.W. J. Dixon, Docks Dept. Southampton	do.
*Sewering, Levelling, Paving, &c.	Kingston-on-Thames Corp.	Surveyor, Clattern House, Kingston	May 11
*Engine House, Boiler House, Chimney Stack, and Workshop	St. Helens' Corp.	J. J. Lackland, Town Hall, St. Helens	do.
*Intermediate Schools	Llangefni County Schools	Headmaster, Nant Villa, Llangefni	May 12
Electric Power Station, Dudley-road, Brierly Hill	Dudley, &c. Electric Traction Co.	T. Robinson, Archt. Victoria-chambers, Stourbridge	do.
C. I. Pipes	Bollington Water Works Co.	W. H. Radford, C.E. Angel-row, Nottingham	May 14
Brick Service Reservoir, &c.	Bollington U.D.C.	do.	do.
*14½ miles of Aqueduct	Birmingham Corp.	J. Mansergh, 5, Victoria-street, S.W.	May 16
*Municipal Lodging House	Southampton Corp.	Borough Engineer	do.
*Custom House, Guayaquill	Goverment of Republic of Ecudor	Consulate, 36, Chapel-walks, South Castle-st. Liverpool	Aug. 30
Four Semi-Detached Villas, Myrtle Field, Belfast	F. W. Henry	W. J. Moore, Archt. Annstreet, Belfast	No date
Fourteen Houses, New-street		do.	do.
Additions to Central Inn, Dundonald, co. Down	G. Herron	do.	do.
Congregational School Church, Bowdon, Manchester		W. Waddington & Son, Archt. Mansfield-chmbrs. Manchester	do.
Eight Cottages, Laundry-place, Abergavenny		E. A. Johnson, Archt. Abergavenny	do
Additions to House, Boathouse Farm, Govilon, near Abergavenny		do.	do.
Additions to Howden Dene, Corbridge-on-Tyne		J. Oswald, Archt. 33, Mosley-st. Newcastle-on-Tyne	do.
Mansion House, Dunkild, N.B.	Duke of Atholl	J. M. Henry, Archt. 7, South Charlotte-st. Edinburgh	do
Sewerage Works, &c.	Alnwick U.D.C.	Surveyor, Council's Offices	do.
Warehouse, Broughton-lane, Sheffield		F. Smith, Archt. 62, Market-street, Manchester	do.
Monastery, Clonard, Belfast	Rev. P. Griffith	A. Ferguson, Archt. Royal-avenue, Belfast	do.
Lecture Hall, &c. Ackworth School, near Pontefract		Clark & Moscrop, Archt. Feethams, Darlington	do.
Eisteddfod Buildings, Swansea Market		Wilson & Moxham, Archt. 15, Castle-street, Swansea	do.
Additions to House, Langland, Swansea		do.	do.
Semi-detacned Villas, Savile Town, Dewsbury		J. H. Brearley, Archt. Hanover-street, Batley	do.
Additions to Bunchrew House, near Inverness		W. L. Carruthers, Archt. 42, Union-st. Inverness	do.
Eight Houses, Bell-lane, Bramley, Yorks.		F. W. Rhodes, Archt. Upper Wortley, Leeds	do.
Water Supply Works, Pipes, &c Cracoe, Yorks.		W. W. Maude, The Fleets, Rylstone. Craven	do.
*Nave and Aisles of Church, Bournemouth	St. Ambrose Church	Boreham & Morton, Sunderland	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in.
*Surveyor and Inspector of Nuisances	Hayward's Heath U.D.C.	110*l.* per annum, combined	April 26
*Clerk of Works	Southampton Corp.	3*l.* 3*s.* per week	April 27
*Temporary Assistant	Garston U.D.C.	2*l.* 2*s.* per week	April 29
*Assistants, Two (Surveyor's Dept.)	Islington Vestry	90*l.* rising to 120*l.* per an.	do.
*Draughtsman	Gold Coast (W. Africa) P.W.D.	250*l.* rising to 300*l.* per an. &c.	April 30
*Clerk of Works	Popesdown U.D.C.	3*l.* 3*s.* per week.	May 2
*Second Assistant (Surveyor's Dept.)	Lewisham B. of W.	30*s.* rising to 50*s.* per week	May 3

Those marked with an asterisk (*) are advertised in this Number. ***Competitions, p. iv*** ***Contracts, pp. iv. vi. & viii.*** ***Public Appointments, pp. xviii. xix. & xxi.***

FRIDAY, APRIL 29.

Architectural Association.—Members' Soirée (Smoking Concert), Café Monico, Piccadilly-circus. 8 p.m.

Institution of Mechanical Engineers.—Ordinary General Meeting (concluded). Mr. S. Tebbutt on "Steam Laundry Machinery." 7.30 p.m.

SATURDAY, APRIL 30.

Sanitary Institute (*Demonstrations for Sanitary Officers*).—Inspection at the Sewage outfall works, Barking.

RECENT PATENTS:

ABSTRACTS OF ACCEPTED SPECIFICATIONS.

Open to opposition until May 30.

[1897] 7,692.—RECORDING AND CHECKING WORKMEN'S TIME, &C.: *W. Whitehead.*—With time stamp type wheels actuated by a clock and an intermittently moved recording strip is combined a frame, having a stamp aperture and platen at its side, adapted to be moved inwards and to return automatically, the strip passing between the platen and another platen opposite the aperture: with the frame is also combined a stamp, bearing the workman's number, to be pressed by him into the aperture, whereby the frame is moved against the strip and the strip against the type wheels, the man's number and the time being recorded upon the strip simultaneously in one line.

7,693.—This invention, by the same patentee, and for the same purpose, relates to improvements in the type of apparatus described in the specifications of letters patent, 21,083, December 3, 1891, and 8,513, April 30, 1894, granted to him, for simplifying and so arranging the respective type wheel governing and locking devices as to make them thoroughly trustworthy, exposed to view, and easily accessible, and to afford means for forming the stamping mechanism into a hand time stamp.

7,931.—WASTE WATER-CLOSETS: *C. Greenhalgh.*—The closet has in combination a pivoted water receptacle, a pedestal with a dished bottom, and a removable grid; the receptacle tips over and discharges its contents as soon as it is overbalanced by the water, the dished bottom retains part of the water, and thus facilitates the flushing. The grid is mounted on slides or similar bearings near the outlet, and a bridge or diaphragm across the outlet pipe prevents the escape of matter from the closet except through the grid.

8,263.—COMBINED HOT AND COLD WATER TAPS: *L. Baxendale and W. R. T. Sinclair.*—To enable one set of valves or taps to serve for the supply, two ordinary screw-down valves (for hot and cold water respectively), and also a third similar valve, are employed; the third valve is double-faced or double-seated, so that, when rotated in one direction, it closes an aperture leading to the spray, shower, or douche, and, when rotated in the opposite direction, it closes an aperture leading to the bath.

10,030.—TO PREVENT THE BURSTING OF PIPES AND OTHER FLUID-CONTAINERS BY FREEZING: *J. E. Brindley.*—In the pipe's interior is placed a tube, made of india-rubber or soft ductile metal, which yields to the pressure of the ice during its formation and, by affording space for the expansion of the ice, relieves the sides of the pipe from pressure; the pneumatic tubes have an internal air-space large enough to compensate the expansion of the ice, and are so sealed that no water can enter into them; their interior may communicate with the air, or may be imperviously sealed throughout.

10,742.—FOR MAKING SANITARY PIPE TRAPS WITH CURVED ARM COMPLETE AT ONE OPERATION: *T. S. Green and S. Wragg.*—The feature of the contrivance is a collapsible core within the curved arm during the process of making, which can be withdrawn in segments, after pressure has been brought to bear and the trap made: the arm core carries keys at the ends adapted to fit into keyways in a loose ring at each end, and the body core and dies or moulds are in sections.

11,440.—STREET SWEEPERS: *J. E. Knox.*—The invention consists in a level pinion drive for the rear end of the brush, the driving pin being secured on the end of a shaft with suitable bearings and brackets, and driven at the front end from the machine's main axle by a level pinion meshing with the level wheel secured to the main wheel, the level pinion being arranged to be thrown into and out of gear.

12,429.—AN IMPROVED DUST CART: *T. H. Gaskin.*—Through the medium of screens which receive rapid reciprocating motion from the wheels of the cart as it travels, the refuse is automatically separated into dust, cinders, &c.; the screens, which are mounted so as to vibrate, deliver from one to the other within compartments formed inside the cart.

13,072.—FASTENERS FOR CUPBOARD AND OTHER DOORS: *D. Jackson.*—To open or fasten both doors by a quarter turn, an angular bracket, having a slot in its front plate, is attached to the underside of the cupboard shelf. The fastener consists of a spindle having at either end a knob and a key or hook fastener tapering to a point and with square shoulders; a collar with two shoulders, on the spindle, that engage with a pin on a plate screwed to the inside of the door, prevents the spindle from receiving more than a quarter turn.

30,000.—TILES AND OTHER ARTICLES OF CERAMIC

WARE, WITH UNDERCUT OR DOVETAILED INDENTATIONS: *T. H. Stubbs.*—The indentations are fashioned by means of pins or pillars fixed to the bed of a tile-press passing through the bottom die of the tile-box above the die's surface; the pins are removed from the tile by the raising of the bottom die on which it rests, and by projections upon the upper surface of the bottom die; the projections, undercut or bevelled inwards, either point one way, so that the tile when raised may be removed from the die, or can be arranged to follow round in a circular direction.

30,214.—ARTIFICIAL STONE: *G. Vögerl.*—The stone, which is described as being more particularly suitable for vaultings, sarcophagi, building-decorations, baths, roofing-tiles, &c., is made by mixing about 40 per cent. of hydraulic cement with 5 per cent. of sand, and about 55 per cent. of whole pig's bristles; these are kneaded with, say, 20 per cent. of water; for greater security, wire netting may be inserted in some of the articles.

[1898] 497.—SANITARY PIPE CONNEXIONS: *J. Jones and F. H. Sprang.*—The rubber sleeves or cones are slit lengthwise so as to enable them to be opened; they are then placed around the joint, and there secured by means of a solution along their edges, flaps of canvas being also preferably used for uniting the edges.

1,319.—BUILDING STONES AND SIMILAR ARTICLES: *P. Kleber.*—For making fireproof stones a mixture of pulverised calcined lime and sand, quartz, &c., is slaked with diluted hydrochloric acid; the fashioned article is next subjected to high-pressure superheated steam. By another method the mixture may be slaked with water, and the article exposed to superheated steam and hydrochloric acid vapour.

2,812.—BRICK AND STONE WORK: *J. W. Klinck and W. Cooke.*—The brick or stone slabs (sub-divided, if desired, into the ordinary size), and made of clay mixed with cement, have V-shaped tongues on two sides, with two V-shaped grooves at the opposite sides, so that they may be fitted together, and chamfered edges, in order that the chamfers may give the appearance of joints. The slabs are for use with "frame" houses—as in Canada, where the patentees live—and have holes obliquely made in the tongues for the passage of nails into the planking fastened on to the studs of the house frame.

NEW APPLICATIONS.

For week ending April 9.

7,962, J. I. Booker, for Corrugated Furnace Flues and analogous purposes. 7,965, J. Macdonald, Smoke-Testing and Fumigating Appliances. 7,966, P. Parsons, Ventilation of Private Houses and Buildings. 7,980, F. Player, Rustless White Metal. 7,985, A. A. Legrand, Automotor. 7,987, T. J. Banbery, Brick-Drying Process. 7,989, J. Doldt, A Vertically Lifting Platform. 8,001, E. D. Ward, Safety Catch for Fastenings. 8,012, W. F. Beardshaw, Drills and Holders therefor. 8,019, O. Patin, Alternating Motors. 8,020, W. Loebinger, Disinfecting Apparatus. 8,025, W. Hillman, Tool Holders and Tools for Slide-rests of Lathes and other Metal-Cutting Machines. 8,028, Viscount H. J. M. P. Camusat de Riancey, Auto-motor Road Vehicles. 8,030, Söhnel & Zehner, Acetylene Gas Apparatus. 8,034, A. Blot, and 8,360, J. Baker, Rotary Motors. 8,036, A. J. Ward, Electric Batteries, or the like. 8,039, S. B. Bamford, Explosion Engines. 8,045, Zimmer and Others, Paints for Coating Iron and other Surfaces. 8,059, B. D. Williams, Lighting Miners' Lamps by Electricity. 8,066, D. Evans, Facilitating the Withdrawal of Props, &c., in Coal and other Mines. 8,070, W. Wood, Electric Trolley Wire Section Insulators. 8,076, F. W. Lanchester, Power-Propelled Vehicles. 8,104, F. M. Bennett, and 8,348, A. C. Heap, Electrical Measuring Instruments. 8,110, C. F. Haninglon, Door Checks. 8,111, H. V. Simpson, for Preserving or Colouring Wood, and rendering it Non-inflammable. 8,112, Firmins, Supply Valves for Lavatories, Wash-basins, Baths, &c. 8,117, Brighton & Bate, Metal Soil and other Pipes. 8,140, G. Wright, and 8,192, R. F. Hall, Switches for Electric Circuits. 8,141, C. H. Hamford, Nail Machines. 8,143, A. J. Pulver, Furnace Grates. 8,159, A. H. Tapp, Litharge or Lead Oxide. 8,160, J. Williams, Safety Pressure Regulators. 8,166, H. Danflou, Making Wheels, Pulleys, and the like, of Wood Veneers. 8,178, F. Gudgin, "Solid Geometry Revolving Chart." 8,180, J. Redman, Window Fasteners. 8,181, P. L. Renouf, Gas Motors. 8,195, R. Dobbie, Kitchen Ranges. 8,229, R. M. Carroll, Spanner or Wrench. 8,231, J. Simon, Fire Escapes. 8,240, W. Borgolte, Roofing Tile. 8,257, H. Danflou, Panels, &c. 8,259, H. G. Smith, Compound for Removing or Loosening Old Paint and Varnish. 8,263, H. T. L'Amie, Draught Regulator for Domestic Fire-places. 8,273-4, H. Oppenheimer, Electric Bells. 8,277, The A. G. Mix & Genest, Multiple Switch-boards. 8,288, Harris & White, Hand Spanners. 8,289, H. L. Wethered, Soil-pipe Junctions. 8,294, Grayl & Turner, Brushes. 8,306, W. Oliphant, Water Heaters. 8,311, H. Leech, Belt for Driving Cone Pulleys. 8,320, West & Hodges, Circular-saw Guard. 8,328, A. Ross, 8,374, G. C. Fricker, 8,393, H. V. James, and 8,449, G. Hill, Electric Arc-lamps. 8,340, Rhodes & Gaunt, Flushing Cisterns. 8,341, H. Wigand, Electric Alarms. 8,358, F. Gould, Stoves. 8,370, H. J. Phillips, Movable Poultry Houses. 8,375, G. Hulbert, A Water or Spirit Level. 8,379, W. H. Rymer, for Cleaning or Clearing Tramway Lines. 8,386, G. O. Homfield-Klopp, Cocks or Taps. 8,394, H. W. Davis, Lead-lined or Coated Pipes and Tubes. 8,398, P. S. Swan, Electric Motors. 8,401, A. Hein, Stands for Theodolites, Levels, Telescopes, &c. 8,412, T. Firth, Pipe Jointing. 8,415, K. W. P. Teale, a Ventilating Apparatus. 8,429, Cameron and Others, Self-acting Valves for Regulating the Discharge of Sewage into Tidal Waters. 8,431, Price & Shaw, Automatic Chucks. 8,443, J. Dawson, Planes. 8,455, T. Grace, Wood Paving for Streets, &c., and Blocks therefor. 8,456, Courtèen & Brown, Self-Propelled or Motor Vehicles. 8,482, W. S. Marriott, Cowls for Chimneys, Ventilating Shafts and the like.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

April 4.—By A. SPAIN & SON.

Brixton.—22 and 24, Rattray-rd., u.t. 76 yrs., g.r. 10*l.* 15s., r. 62*l.* £640
74, Kellett-rd., u.t. 75 yrs., g.r. 6*l.* 6s., r. 36*l.* .. 370

By T. B. WESTACOTT.

City-rd.—31, Nile-st., f., e.r. 35*l.* 410
Stratford.—1, 12, 14, and 16, Mount-st., f., r. 52*l.* 415
Highbury.—139, Highbury Hill, u.t. 79 yrs., g.r. 6*l.* 43*l.* 475

Camden Town.—158, High-st., u.t. 70½ yrs., g.r. 30*l.*, r. 175*l.* £2,410
3, Greenland-pl., u.t. 70½ yrs., g.r. 16*l.*, r. 155*l.* .. 1,370
146, Great College-st., and "Eagle Wharf," r. 305*l.*, also l.g.r. 9*l.*, u.t. 68 and 23 yrs., g.r. 57*l.* 3,410
10 and 11, Stanmore-pl., u.t. 25½ yrs., g.r. 14*l.* .. 600

By FRANK LLOYD (at Wrexham).

Broughton, Denbigh.—Eight freehold cottages, r. 55*l.* 5s. 400
Wrexham, Denbigh.—A freehold field, 4 a. 0 r. 17 p. 400
Cerney, Denbigh.—"Pendwllyn Farm," 3 a. 3 r. 23 p., f. 310

April 5.—By G. F. HARRINGTON.

Regent's Pk.—75, Osnaburgh-st., u.t. 25 yrs., g.r. 7*l.*, r. 55*l.* 360

By F. VARLEY.

Finsbury Pk.—48 and 58, Chatterton-rd., u.t. 76½ yrs., g.r. 10*l.*, r. 60*l.* 600
28, Athelstane-rd., u.t. 67 yrs., g.r. 5*l.*, r. 26*l.* .. 225
Holloway.—28, Cornwallis-rd., u.t. 65 yrs., g.r. 6*l.* 6s., r. 32*l.* 305
Crouch Hill.—3, Sparsholt-rd., u.t. 48 yrs., g.r. 5*l.* 10s., r. 38*l.* 285

By WILLIS & CROUCH.

Holloway.—14, 34, 35, and 48, Loraine-rd., f., r. 164*l.* 2,990

By G. GOULDSMITH, SON & CO.

South Tottenham.—Broad-lane, f., g.r. 79*l.* 4s., reversion in 77 yrs. 1,935
Victoria-rd., f.g.r. 91*l.* 10s., reversion in 77 yrs.. 2,175
Stamford-rd., f.g.r. 28*l.*, reversion in 77 yrs. 700
Newton-rd., f.g.r. 90*l.*, reversion in 79 yrs..... 2,070
Walton-rd., f.g.r. 46*l.* 10s., reversion in 79 yrs... 1,075
Crouch Hill...Arundel-ter., &c., i.g.r. 47*l.* 10s., u.t. 75 yrs., g.r. 10*l.* 10s. 850
Sparsholt-rd., &c., i.g.r. 120*l.*, u.t. 75 yrs., g.r. 17*l.* 2,330

By ALLEN & HOAR.

Harringay.—8 and 10, Mattison-rd., f., r. 72*l.*..... 1,030
Harlesden.—Inman-rd., four plots of freehold land 950

By HEPPER & SONS (at Leeds).

Leeds.—51, Briggate; 1 to 20, Turk's Head Yard; 20 and 21, Trinity-st., and the "Turk's Head" Inn, area 813 yds., f., r. 626*l.* 28,700

By WILLIAM HOUGHTON (at Walthamstow).

Walthamstow.—Chelmsford-rd., a freehold building site, with building thereon 215
Shernal-st., a freehold building site 185
202, Higham Hill-rd., f. 175

By FLEURET, SON, & ADAMS (at Masons' Hall Tavern).

Somers Town.—Seymour-st., the "Prince Arthur" b.-h., f.g.r. 55*l.*, reversion in 29 yrs..... 2,950
Chapel-st., the "Joiner's Arms" b.-h., f.g.r. 12*l.* 10s., reversion in 12¼ yrs..... 3,000

By ORGILL, MARKS, & ORGILL (at Masons' Hall Tavern).

Highgate.—Swain's-lane, the "Duke of St. Albans" b.-h., f., with goodwill 14,010

By W. ROLFE (at Masons' Hall Tavern).

Marylebone. — Manchester-st., the "Lincoln Hotel," u.t. 15 yrs., r. 100*l.*, with goodwill.... 7,800
Winchmore Hill.—The "King's Head" p.-h., a building lease for 60 yrs., r. 150*l.* 2,320

By HUMBERT & FLINT (at Watford).

Watford, Herts.—15, King-st., f., e.r. 50*l.*..... 900
1, George-st., f., r. 20*l.* 330
George-st., a corner plot of land, f., r. 18*l.*..... 440
Vicarage-rd., a plot of garden land, 1 r., f..... 400
9 to 12, Lamb-yard, f., r. 36*l.* 8s. 290

By PENNEY & CLARK (at Southsea).

Southsea, Hants.—111, St. Andrew's-rd., f. 400

April 6.—By H. C. BIGDEN.

Battersea.—11, 13, and 15, Winstanley-rd., u.t. 66½ yrs., g.r. 16*l.* 10s. 650
Wandsworth.—19 to 33 (odd), Allfarthing-lane, u.t. 54½ yrs., g.r. 20*l.* 500
Tooting.—13, Selkirk-rd., u.t. 80½ yrs., g.r. 8*l.*, r. 30*l.* 275

By HARDS & BRADLY.

Greenwich.—111, 113, 119, and 121, Annandale-rd., u.t. 66½ yrs., g.r. 16*l.* 16s., r. 111*l.* 16s..... 1,005
Lee.—29 and 31, Micheldever-rd., u.t. 83 yrs., g.r. 15*l.*, r. 87*l.* 750

By F. JOLLY & CO.

Hackney.—118 to 124 (even), Amhurst-rd., u.t. 68 yrs., g.r. 40*l.*, r. 201*l.* 4s. 2,020

By KETTLE & BUTLER.

Tottenham.—Handsworth-rd., f.g.r. 33*l.*, reversion in 99 yrs. 900

By MAPLE & CO.

Hampstead.—18, 20, 22, and 24, Kingdon-rd., u.t. 83 yrs., g.r. 32*l.*, r. 190*l.* 1,650

By TOOTH & TOOTH (on the premises).

Finchley.—Friern Park, "Neville Lodge," and 4½ a., f. 4,075

By ALFRED PREECE (at Camberwell).

Peckham.—31 and 33, Nunhead Green, u.t. 67 yrs., g.r. 8*l.*, r. 56*l.* 365
107, 111, and 113, Gordon-rd., u.t. 67 yrs., g.r. 15*l.* 585
41, Clifton-rd., u.t. 47 yrs., g.r. 8*l.*, r. 35*l.*..... 295
Dulwich.—22, 24, 26, and 28, Goodrich-rd., u.t. 80 yrs., g.r. 10*l.* 685
110 and 112, Landcroft-rd., u.t. 80 yrs., g.r. 6*l.*... 355

By A. DOWELL (at Edinburgh).

Lesmahagow, Lanarkshire.—The Estates of Harperfield and Greenstrands, area 333 a. 10,000

April 7.—By W. STEVENS.

De Beauvoir Town.—8, De Beauvoir-cres., u.t. 31 yrs., g.r. nil, also l.g.r. 12*l.*, u.t. 31 yrs., g.r. 12*l.* 250

By THOMAS WRIGHT.

Holloway.—25, Eukel-st., u.t. 73 yrs., g.r. 5*l.* 9s., r. 30*l.* 315
Harringay.—74, Wightman-rd., u.t. 89 yrs., g.r. 8*l.* 8s., e.r. 40*l.* 425

By ROBERTS, SON & TORY (at Yeovil).

Yeovil, Som.—7, High-st., area 2,600 ft., f. 3,800

April 11.—By E. J. GILDERS (at Clacton).

Clacton-on-Sea, Essex.—Hayes-rd., two plots of building land, f. 251
1 and 2, Magdalen Green, f., r. 21*l.* 10s..... 470
Magdalen Green, two freehold houses and cottage tenement, r. 17*l.* 660

April 12.—By ROGERS, CHAPMAN & THOMAS.

Putney.—265, Upper Richmond-rd., u.t. 78 yrs., g.r. 28*l.*, r. 120*l.* 940

April 14.—By DAVID J. CHATTELL.

Newington.—75 and 85, Union-rd., u.t. 45¼ yrs., g.r. 13*l.* 10s., r. 83*l.* £915
Walworth.—148, Lorrimore-rd., and 35, Cook's-rd., r. 50*l.*; also l.g.r. 3*l.* 10s., u.t. 51 yrs., g.r. 7*l.* 10s. 535

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.

PRICES CURRENT OF MATERIALS.

TIMBER		
Greenheart, B.G. ton	8/0/0	0/0/0
Teak, E.I....load	9/0/0	14/2/0
Sequoia, U.S.ft.cu.	1/8	1/10
Ash, Canada, load	2/7/6	3/12/6
Birch, do.....	2/1c/0	4/2/6
Elm, do.....	3/2/6	4/2/6
Fir, Dantsic, &c..	1/11/0	3/11/0
Oak, do.....	2/3/0	3/3/0
Canada	3/15/0	5/0/0
Pine, Canada red	c/c/0	0/0/0
Do. yellow	2/5/0	4/5/0
Lath, Dantsic, fath	4/1c/0	5/10/0
St. Petersburg..	5/0/0	6/10/0
Wainscot, Riga, &c., log.....	3/15/0	5/10/0
Odessa, crown....	3/15/0	5/10/0
Deals, Finland 2nd & 1st std 100	8/0/0	8/10/0
Do. 4th & 3rd ..	8/c/0	8/1c/0
Do. Riga	6/10/0	7/10/0
St. Petersburg, 1st yellow	10/0/0	12/10/0
Do. 2nd yellow.	9/0/0	10/10/0
Do. white	8/10/0	1c/10/0
Swedish	9/0/0	15/0/0
White Sea	9/10/0	16/0/0
Canada, Pine 1st	10/5/0	25/5/0
Do. do. 2nd	13/15/0	16/5/0
Do. do. 3rd, &c.	6/5/0	9/15/0
Do. Spruce, 1st	10/5/0	11/15/0
Do. do. 3rd and 2nd	7/15/0	8/15/0
New Brunswick	6/15/0	7/15/0
Battens all kinds	5/0/0	12/0/0
boards, sq., 1 in. prep. 1st.....	9/0	16/6
Do. 2nd	7/6	13/3
Other qualities—	6/0	7/0
Cedar, Cuba, ft.	/4	/4½
Honduras, &c.	/3¾	/4½
Mahogany, Cuba	/5	/6½
St. Domingo, cargo av.	/4¾	0/1/3
Mexican, do. do.	/3¾	/4
Tobasco, do. do.	/4	/6½
Honduras, do.	/4	/6
Box, Turkey, ton	4/0/0	25/0/0
Rose, Rio	7/0/0	14/0/0
Bahia	6/0 0	12/0/0
Satin, St. Doming.	0/0/5	0/1/0

TIMBER *(continued)*.		
Satin, Porto Rico	0/0/6	0/1/6
Walnut, Italian ..	0/-/3	0/0/7
METALS.		
Iron—Pig, in Scotland .....ton	2/6/1½	2/6/4½
Bar, Welsh, in London	5/15/0	5/17/6
Do. do. at works in Wales	5/10/0	5/12/6
Do. Staffordshire, in London.....	6/5/0	7/10/0
COPPER—British cake and ingot	55/15/0	56/c/0
Best selected ..	56/10/0	57/0/0
Sheets, strong..	61/0/0	61/10/0
Chili bars	51/12/6	0/0/0
YELLOW MTL. lb.	5d.	5¼d.
LEAD—Pig Spanish ....ton	13/0/0	0/0/0
English com. bands	13/5/0	0/0/0
Sheet, English 6 lbs. per sq. ft. and upwards ..	14/5/0	0/0/0
Pipe.....	14/15/0	0/0/0
ZINC—English sheet.....ton	20/5/0	0/0/0
Vieille Montagne	21/10/0	0/0/0
Spelter	18/12/6	18/15/0
TIN—Straits	64/15/0	0/0/0
Australian.....	65/5/0	65/15/0
English Ingots..	67/10/0	68/10/0
Banca	61/0/0	0/0/0
Billiton	59/15/0	60/0/0
OILS.		
Linseed .....ton	15/15/0	0/0/0
Cocoanut, Cochin	27/15/0	c/0/0
Do. Ceylon.....	22/0/0	0/0/0
Palm, Lagos	21/15/0	0/0/0
Rapeseed, English pale	27/10/0	0/0/0
Do. Brown	26/0/0	c/c/0
Cottonseed ref.....	14/5/0	15/5/0
Oleine.....	13/10/0	14/10/0
Lubricating U.S.	0/5/3	0/7/6
Do. Black	0/5/0	0/6/6
TAR—Stockholm barrel	1/5/0	0/0/0
Archangel	0/12/6	0/0/0
Turpentine	24/-/0	0 0/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated by the name and address of the sender; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]

BAILDON GREEN, SHIPLEY (Yorks).—Accepted for the erection of a new hotel, Baildon Green, to be called the "Cricketers' Arms," for Bentley's Yorkshire Breweries, Limited, Brewers, Woodlesford, near Leeds. Mr. B. Wood Higgins, architect, Oulton, near Leeds. Quantities by architect:—

Excavator, Mason, Bricklayer, and Drainer's Work.—Rhodes Bros., Shipley	£787 0 0
Joiners and Carpenters' Work.—E. Avison, 854, Manchester-road, Bradford.....	256 0 0
Plumbers and Glaziers' Work.—Thos. Sutton, 10, Dodsworth-court, Briggate	146 0 0
Slaters' Work.—Wm. Atkinson, 79, Kirkstall-road, Leeds	81 18 0
Plasterers' Work.—John. Walsh, Dale-street, Shipley	66 12 0
Ironmongers' Work.—Hy. Leggott & Co., 73, 75, and 77, Market-street, Bradford	57 10 3
Painters and Grainers' Work.—C. L. Leach, Leeds-road, Bradford.....	20 0 0
	£1,415 0 3

[Architect's estimate, £1,500.]

BOURNEMOUTH.—For the execution of sewerage works, Pokesdown, for the Urban District Council. Mr. E. W. Ingamells, Engineer, Council's offices, Pokesdown. Quantities by Mr. C. E. Bruges, C.E., Victoria-street, Westminster:—

Contract No. 1.

For nine miles sewers, varying from 4 ft. by 2 ft. 8 in. to 9 in. diameter, M.Hs. &c.

Parfit & Monks.....	£17,885	Law	£15,407
Bell	16,637	Troke	13,950
Cooke & Co.	15,647	W. H. Saunders & Co.,	
W. Jones.....	15,575	Scuthampton*	13,272

Contract No. 2.

For 21 in. cast-iron sea outfall, 1,500 ft. long.

Bell	£6 630	W. H. Saunders & Co. ..	£5,274
Jones	6,616	Cooke & Co., West-	
Swales	6,100	minster*.....	3,728

* Accepted.

BRENTWOOD (Essex).—For the erection of workshops, for the Hackney Union Guardians. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C.:—

Potter.....	£4,150	Lamble, Rhyl-street, Ken-	
Barrett & Power	3,970	tish Town (accepted)	£3,723

BURNLEY.—Accepted for the erection of eight houses, Victoria-terrace, Briefield. Mr. Dent, architect, Railway-street, Nelson, Lancs. Quantities by the architect:—

Masonry (labour only).—W. Dent, Briercliffe, Burnley	£575 0 0
Joinery.—G. Pollard, Nelson	930 0 0
Plumbing.—C. Tattersall, Briefield	372 19 0
Plastering.—Hartley Bros., Nelson	184 11 3

BURTONPORT (co. Donegal).—For the erection of a church. Mr. E. J. Toye, architect, Strand, Derry:—

Daniel McCaffery, Strabane, co. Tyrone*.....	£1,649 13 1

* Lowest of three.

CARDIFF.—For the erection of St. Paul's New Congregational Church, Cowbridge-road, for the Committee. Messrs. Veall & Sant, architects, Cardiff:—

	For the church, exclusive of galleries to seat 474.			For the church, including galleries to seat 878.		
Shepton & Son	£3,595	3	0	£4,164	0	0
W. Matthias	3,522	0	0	4,046	0	0
Symonds & Co.	3,460	0	0	4,022	10	0
O. Purnell	3,483	0	0	3,975	0	0
W. H. Ingleson	3,350	0	0	3,936	10	0
Knox & Wells	3,417	0	6	3,929	0	0
Turner & Sons	3,280	2	3	3,822	4	6
C. C. Dunn	3,104	0	0	3,523	8	0
W. T. Morgan	*2,950	0	0	3,411	0	0

[All of Cardiff.]
* Reduced to £2,646, and accepted.

CHESTERFIELD.—For the erection of Primitive Methodist Chapel, near Chesterfield. Mr. W. J. Morley, architect, 269, Swan-arcade, Bradford:—

Masonry, Brickwork, Plastering, and Slating.—W. Oakey, Bolsover.
Joinery.—W. Wilson & Son, Castleford.
Plumbing.—Aves & Houlton, Mansfield.
Painting.—Harland & Son, Bradford.
} £1,800

EGHAM.—For the erection of villas and shoeing forge, Egham Hill, for Messrs. W. & E. Oldridge. Mr. J. W. Oades, architect, Egham:—

W. Simpson	£1,366 16 6	C. Buckeridge*	£983 0 0
W. Beauchamp	1,128 0 0	W. Latchwell (withdrawn)	940 10 0
C. Searle	995 10 0		

* Accepted.

HARROW.—For the erection of disinfector buildings, &c., for the Urban District Council. Mr. T. Charles, Surveyor, Harrow:—

J. & J. Bailey, Wealdstone	£285	H. Woodbridge, Harrow*	£225
F. Gough & Co., Hendon	274		

* Accepted.

LEEDS.—For additions to the Friends' School, Rawdon, for the Bi-centenary Committee of the Rawdon Friends' School. Messrs. Jackson & Priestman, surveyors. Quantities by surveyors:—

William Johnson	£991 5 5	H. Kendal	£690 0 0
J. Walker & Sons	831 0 0	T. Obank & Sons	642 0 0
William Atkins	776 0 0	W. Fiesher & Sons, Rawdon (accepted)	626 18 0
W. Hargreaves	710 12 5		

LLANELLY.—For the erection of school buildings, &c. (boys school, with additions to the infant department), for the School Board. Mr. J. B. Morgan, architect, New-road, Llanelly:—

D. Jonkins	£3,349 0 0	T. & J. Brown	£2,629 0 0
J. Evans	3,103 0 0	B. Howell & Son	2,596 16 4
G. Mercer	2,885 0 0		

LLANELLY.—For the erection of a school, St. Paul's, for the Llanelly School Board. Mr. J. B. Morgan, architect, Llanelly:—

D. Jonkins	£2,505	G. Mercer	£2,094
J. Evans	2,361	B. Howell & Son	2,082
T. & J. Brown	2,190		

LONDON.—For repairs and repainting Homerton-row School, for the School Board for London:—

Stevens Bros.	£626 10	Marchant & Hirst	£548 0
Grover	594 0	Silk & Son	545 0
Crueys	571 0		

LONDON.—For general repairs at 34, Newington Green-road, London, for Messrs. Smith, Garrett & Co., brewers. Messrs. Foulsham & Riches, architects, 105, Bromley High-street:—

Osborn & Son	£378	Sheffield Bros.	£250
Enkpen	295	A. J. Sheffield	218
Brown	270	B. Blissenden (accepted)	205

LONDON.—For the erection of house and stables, College-road, Dulwich, for Mr Walter Hoggan. Mr. Edwin J. Sadgrove, architect:—

J. & C. Bowyer	£6,400	Ham & Son	£5,980
W. Young	6,242	J. Bowyer	5,900
Lyle Manufacturing Co.	6,100	Edwards & Medway	5,767
W. Smith	5,984		

LONDON.—For pulling down and rebuilding the "Gladstone" beer-house, Walworth, S.E., for the Winchester Brewery Company, Limited. Mr. T. Walter Moss, architect:—

C. Ansell	£1,653	Ham & Son	£1,396
W. Smith	1,428	Summerford	1,323

C. B. N. SNEWIN

MAHOGANY, WAINSCOT, WALNUT, TEAK, VENEER, and TIMBER MERCHANT,

Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, & 17, BACK HILL, HATTON GARDEN, and 29, RAY STREET, FARRINGDON ROAD, E.C.

THE LARGEST STOCK OF ALL KINDS OF WOODS IN EVERY THICKNESS, DRY, AND FIT FOR IMMEDIATE USE.
Telephone, No. 774 Holborn. Tele. Address: "SNEWIN, London."

LONDON.—For pulling down and rebuilding No. 40 and 42, Broadway, Stratford, E., for Alderman George Hay. Mr. Edwin C. Stimson, architect, 22, Atherton-road, Forest Gate, E.:—

Yerbury & Sons	£7,993	J. Smith & Son	£7,564
W. Gregar	7,969	W. Shurmur	7,563
G. J. Hosking	7,740	A. Reed & Son	7,546
W. Downs	7,667	W. H. Lorden & Son	7,492
Colls & Sons	7,665	W. Gladding*	7,398
Patman & Fotheringham	7,650	Snewin Bros.	7,047
W. M. Norton	7,594		

* Accepted.

LONDON.—For alterations to the "Half Moon and Seven Stars" inn, St. George's-street, S.E., for Mr. Daniel Fowley. Mr. Joseph G. Needham, architect, 18, Lower Clapton-road, N.E.:—

Building.

G. E. Todd	£2,335	A. Hood	£1,942
Inkpen	2,232	W. J. Maddison (accepted)	1,830

Gas-fittings.

Steadman (accepted) £205 17 6

Pewtering.

Rogers	£96 0 0		
G. Rogers, Commercial-road (accepted)	80 0 0		

UXBRIDGE.—For the construction of 14 miles of sewers, for the Rural District Council. Mr. Jno. Austie, C.E., 17, Victoria-street, Westminster, S.W. Quantities by Engineer:—

H. Morecroft	£31,986	Geo. Bell	£19,960
Geo. Wimpey	24,798	A. Kellett, Willesden*	19,870
W. H. Saunders	22,580	Geo. Rutter (withdrawn)	18,592
F. A. Jackson	22,423		

* Accepted.

WOODFORD.—For the erection of house, Cleveland-road, Woodford, for Mr. H. W. Small. Mr. J. Walter Wyles, architect, 17, Finsbury-pavement, E.C.:—

E. Wells & Son	£697	J. Joliffe	£625
F. Ranger	675	T. Young, Woodford*	560
J. Riley	625		

* Accepted.

TO CORRESPONDENTS.

H. W. S.—(Amount should have been stated).—J. M. L. (We do not think the publication of your letter would assist the cause).

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article is given subject to the approval of the article, when written, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

W. H. Lascelles & Co.,

121, BUNHILL ROW, LONDON, E.C.

Telephone No. 270.

HIGH-CLASS JOINERY,
LASCELLES' CONCRETE

Architects' Designs are carried out with the greatest care.

CONSERVATORIES,
GREENHOUSES,
WOODEN BUILDINGS,
Bank, Office, & Shop Fittings.
CHURCH BENCHES & PULPITS.

ESTIMATES GIVEN ON APPLICATION.

TERMS OF SUBSCRIPTION.

"THE BUILDER" (Published Weekly) is supplied DIRECT from the Office to residents in any part of the United Kingdom, at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, New Zealand, India, China, Ceylon, &c., 26s. per annum. Remittances (payable to DOUGLAS FOURDRINIER) should be addressed to the publisher of "THE BUILDER," No. 46, Catherine-street, W.C.

SUBSCRIBERS in LONDON and the SUBURBS (by prepaying at the Publishing Office, 19s. per annum or 4s. 9d. per quarter), can ensure receiving "The Builder, by *Friday Morning's Post*.

THE BATH STONE FIRMS, Ltd.
BATH,
FOR ALL THE PROVED KINDS OF
BATH STONE.
FLUATE, for Hardening, Waterproofing, and Preserving Building Materials.

HAM HILL STONE.
DOULTING STONE.
The Ham Hill and Doulting Stone Co.
(Incorporating The Ham Hill Stone Co. and C. Trask & Son The Doulting Stone Co.).
Chief Office:—Norton, Stoke-under-Ham, Somerset.
London Agent:—Mr. E. A. Williams, 16, Craven-street, Strand.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 42, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. Asphalte Contractors to the Forth Bridge Co. [ADVT.

SPRAGUE & CO., Ltd.,
LITHOGRAPHERS AND PRINTERS.
Estate Plans and Particulars of Sale promptly executed.
4 & 5, East Harding-st., Fetter-lane, E.C. [ADVT.

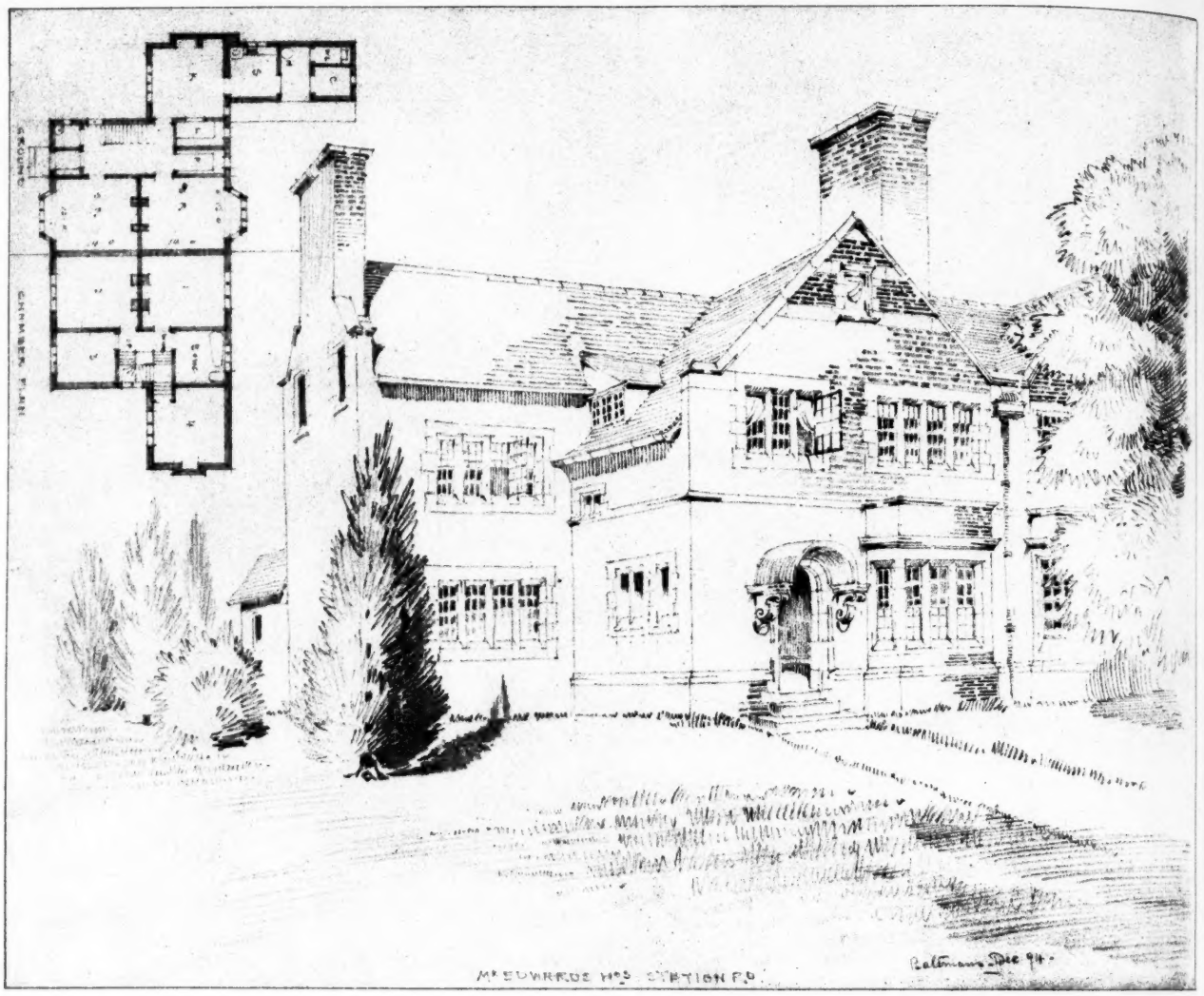
QUANTITIES, &c., LITHOGRAPHED accurately and with despatch.
METCHIM & SON { 8, PRINCES STREET, GT. GEORGE ST. WESTMINSTER
"QUANTITY SURVEYORS' DIARY AND TABLES," For 1898, price 6d. post 7d. In leather 1/- Post 1/1 [ADVT.

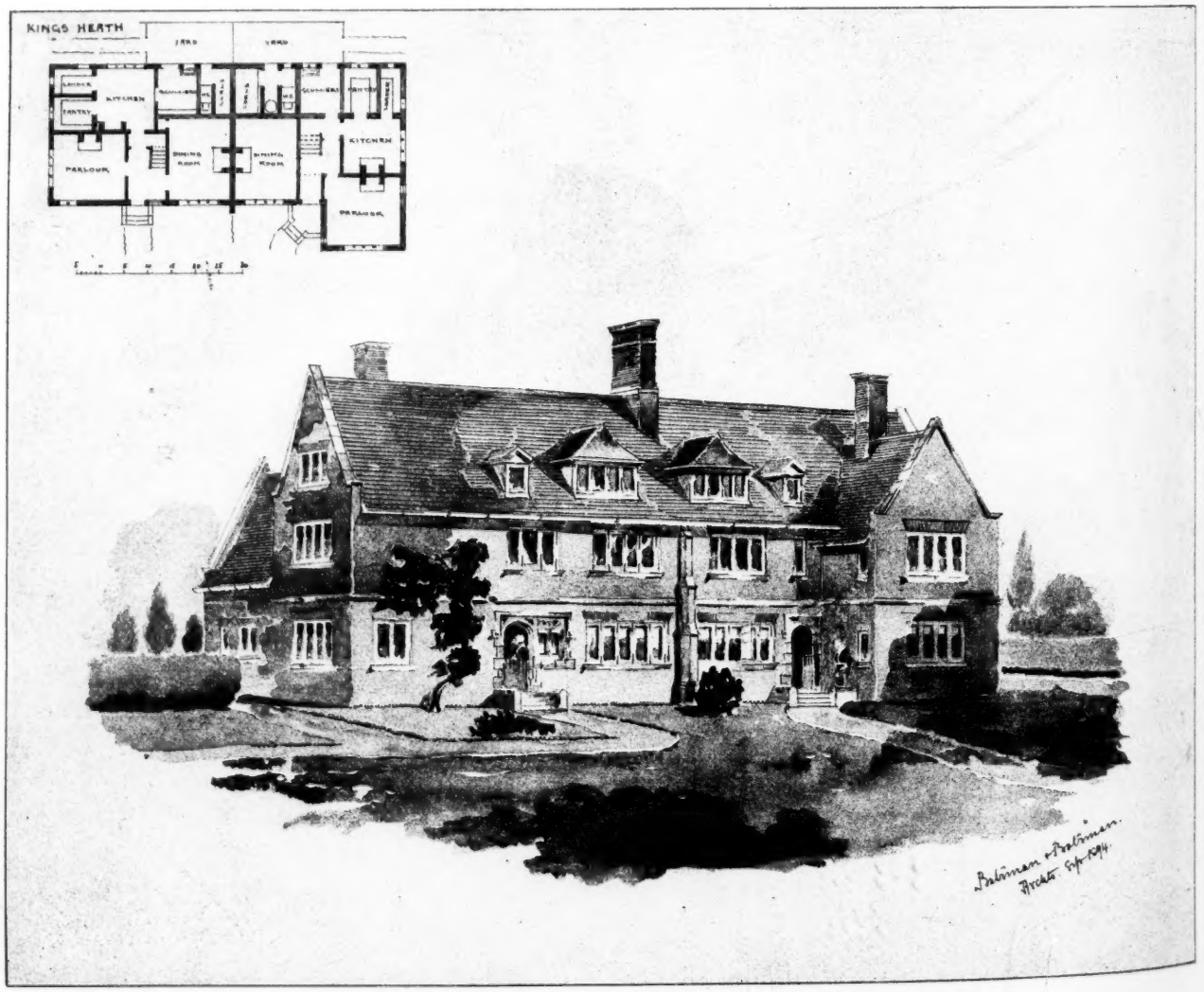
PILKINGTON & CO
(ESTABLISHED 1838),
MONUMENT CHAMBERS,
KING WILLIAM STREET, LONDON, E.C.
Telephone No., 2751 Avenue
Registered Trade Mark,
Polonceau Asphalte.
PATENT ASPHALTE and FELT ROOFING.
ACID-RESISTING ASPHALTE.
WHITE SILICA PAVING.
SEYSSEL ASPHALTE.

ERNEST MATHEWS & CO. 61, ST. MARY AXE, LONDON, E.C.
CONTRACTORS TO H.M. GOVERNMENT FOR SLATES AND SLATE BATHS.
PERMANENT GREEN SLATES, AS USED ON THE LAW COURTS AND OTHER PUBLIC BUILDINGS.
ROOFING SLATES OF EVERY DESCRIPTION. | SLATE SLABWORK OF EVERY DESCRIPTION, PLAIN AND ENAMELLED.
MARBLE & ENAMELLED SLATE CHIMNEY-PIECES,
Marble and Enamelled Slate Lavatory Tops and Fittings complete, Slate Cisterns, Shelves, and Urinals.
Works—Aberllefenny, North Wales. Midland Wharf, Bow. Payne-road Wharf, Bow.
Head Office and only City Address, 61, ST. MARY AXE, E.C. Branch House, 37, Victoria-street, Bristol.
SEND FOR ILLUSTRATED PRICE LIST

PHOTO-LITHO. SPRAGUE & Cº 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

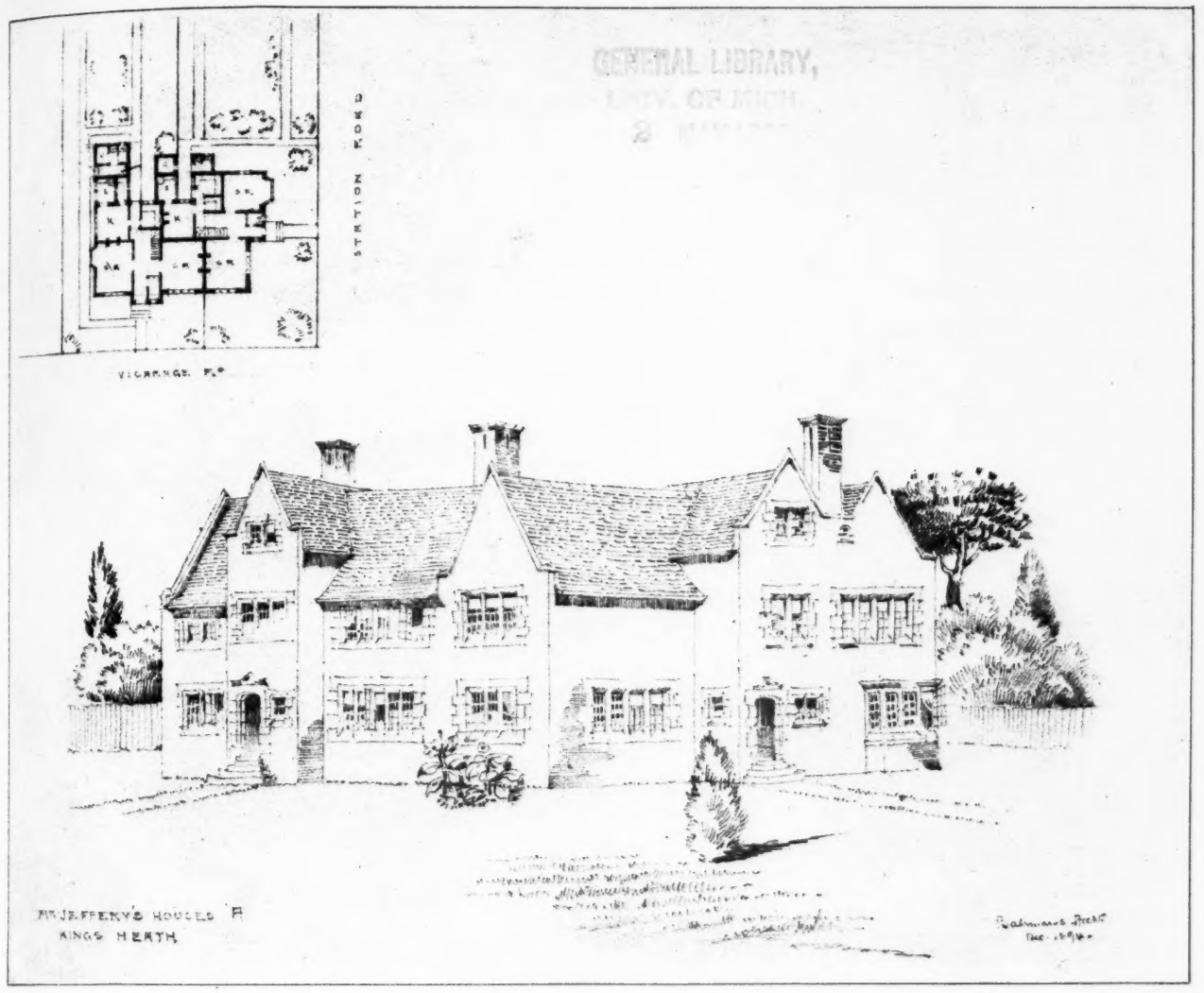
PIGGOT'S MANOR, HERTFORDSHIRE.—Messrs. Hesketh & Stokes, Architects.





VIEW FROM VICARAGE ROAD, RIGHT HAND CORNER OF NEW ROAD.

GENERAL LIBRARY,
UNIV. OF MICH.



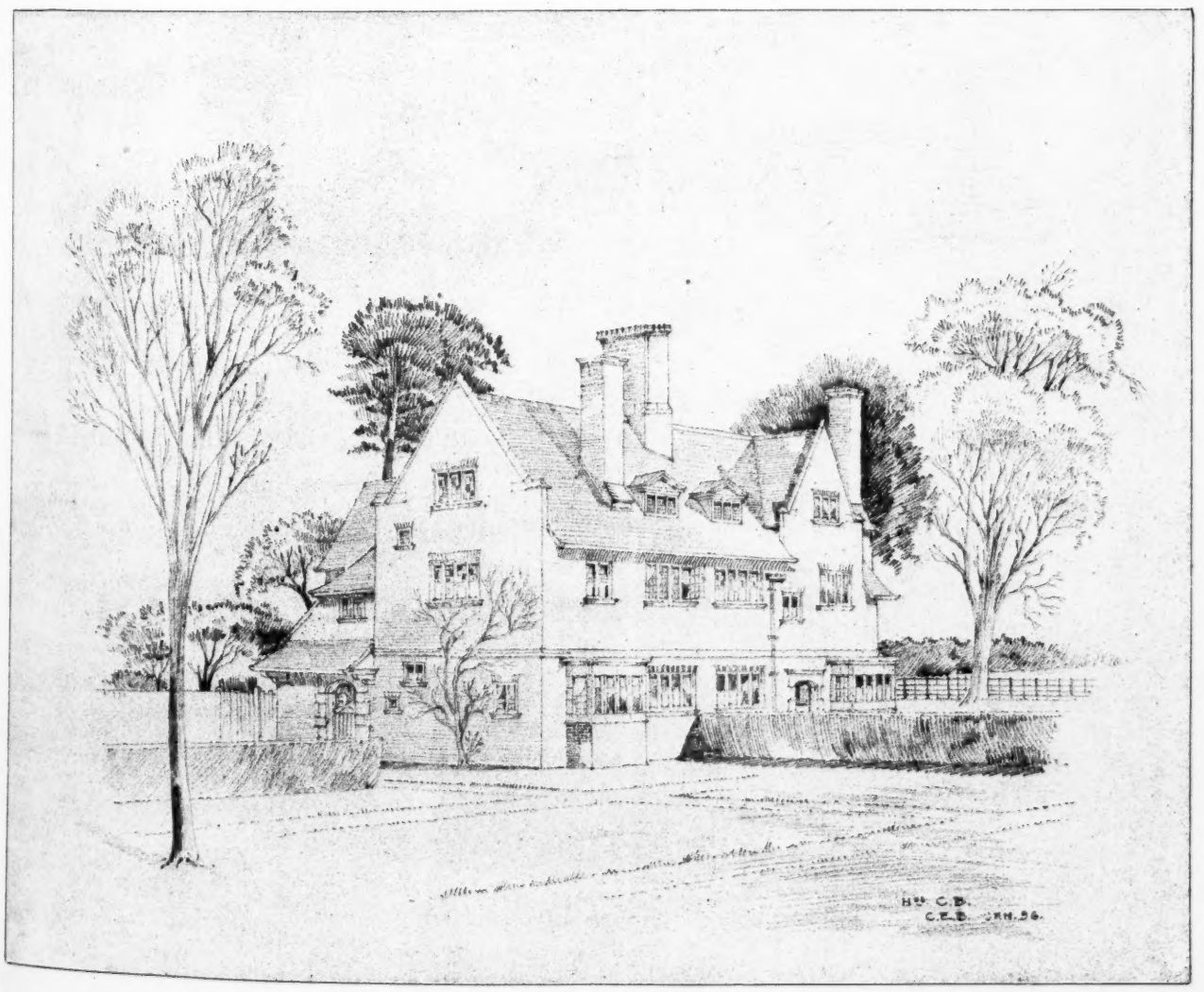


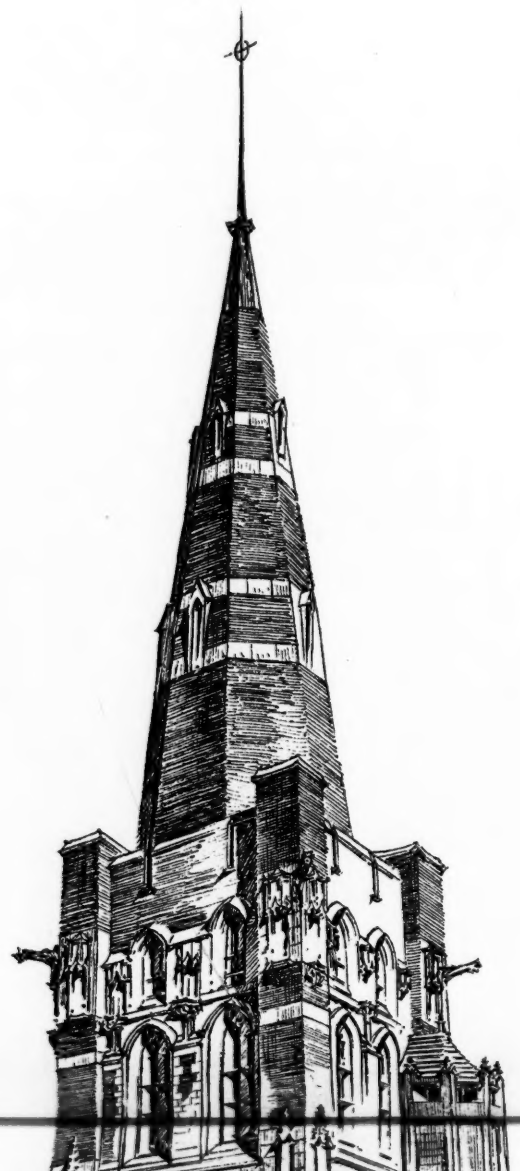
PHOTO-LITHO. SPRAGUE & Co. 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

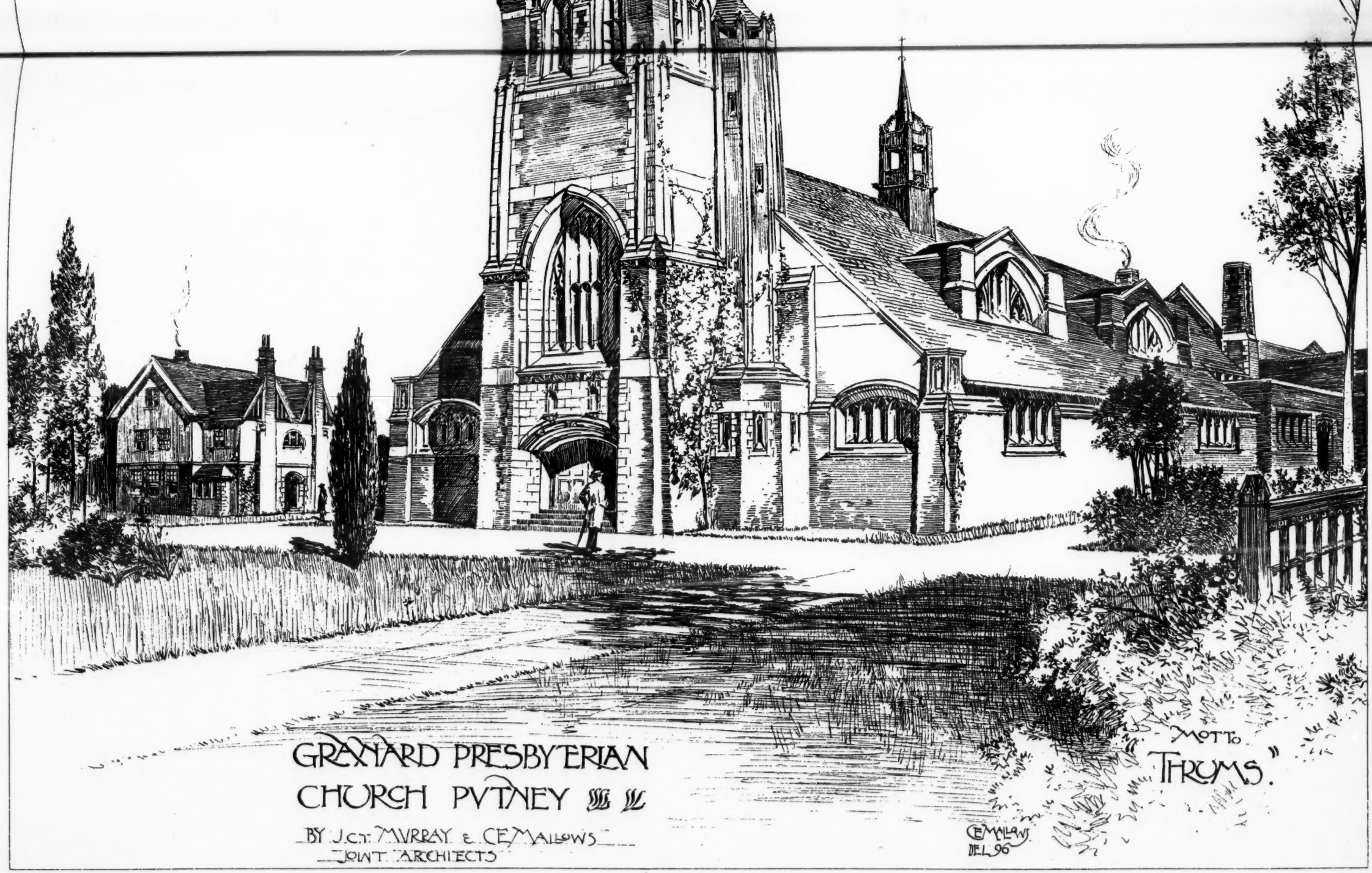
MESSRS. BATEMAN & BATEMAN, ARCHITECTS.

INK-PHOTO, SPRAGUE & Co 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

BILLIARD ROOM, PIGGOT'S MANOR, HERTFORDSHIRE.—Messrs. Hesketh & Stokes, Architects

GENERAL LIBRARY,
UNIV. OF MICH.
2 MAY 1898





GRAYHARD PRESBYTERIAN
CHURCH PUTNEY

BY J.C.T. MURRAY & C.E. MALLOWS
JOINT ARCHITECTS

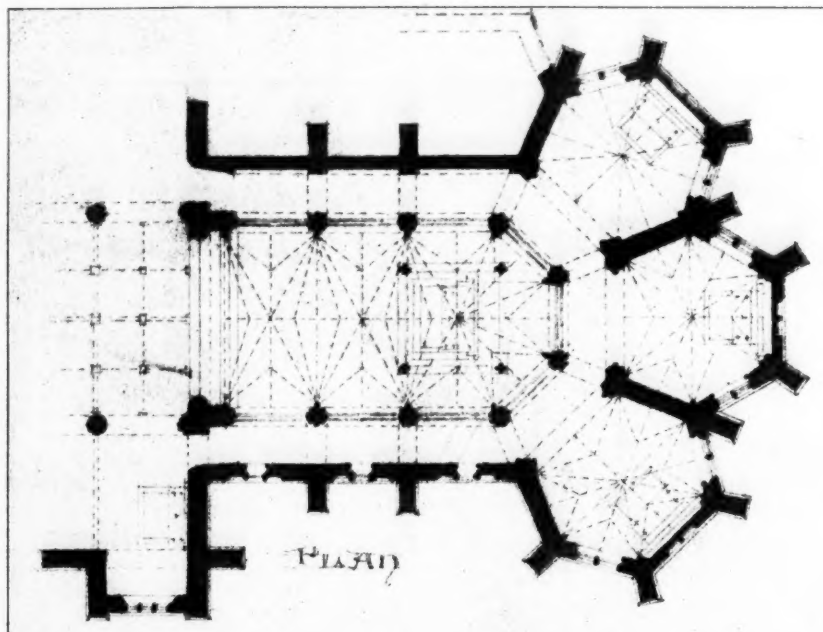
MOTTO
"THRUMS."

C.E.MALLOWS
DEL 96

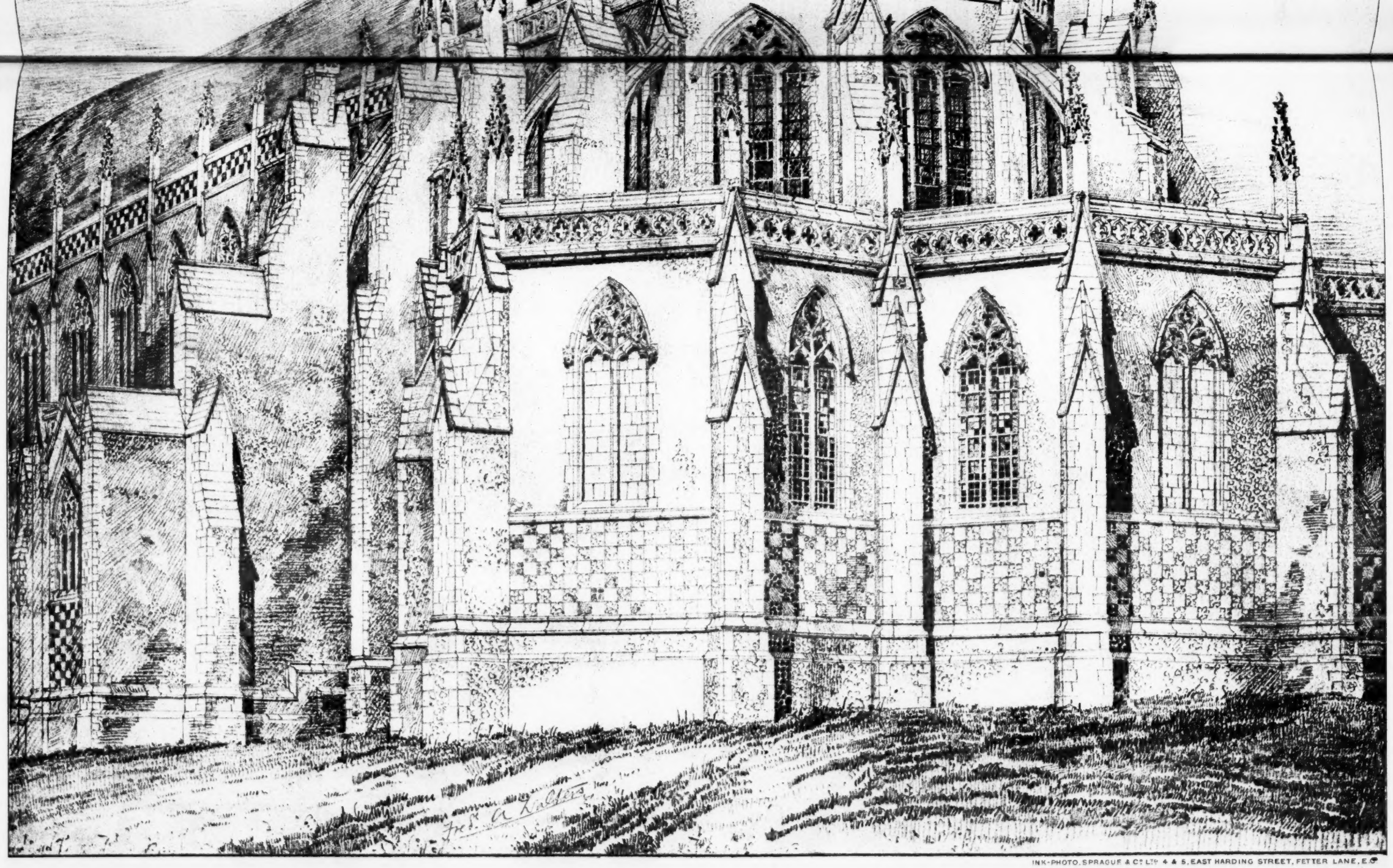
GENERAL LIBRARY,
U. OF MICH.
2 MAY 1899

PHOTO-LITHO. SPRAGUE & Co LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

GENERAL LIBRARY,
UNIV. OF MICH.
2 MAY 1898



PLAN



INK-PHOTO. SPRAGUE & Co LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

NEW CHANCEL AND CHAPELS, CHURCH OF THE SACRED HEART, WIMBLEDON.—Mr. F. A. Walters, F.S.A., Architect.